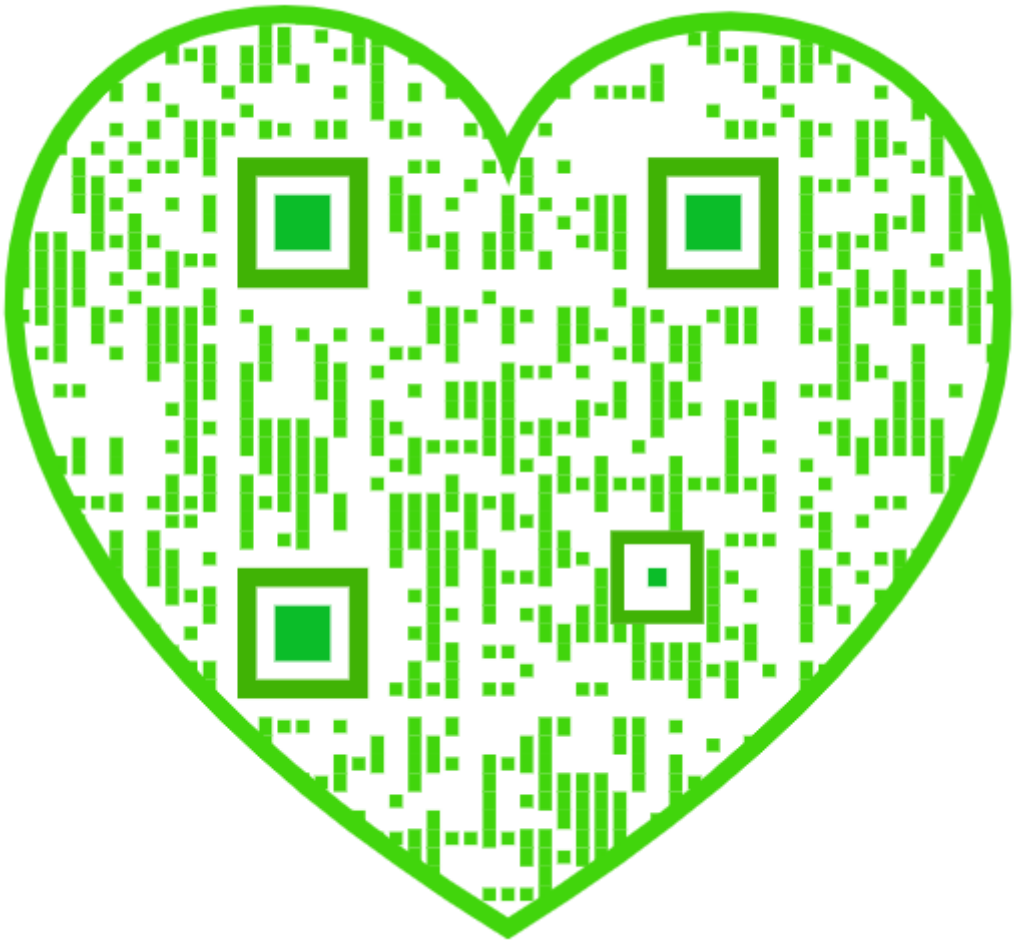

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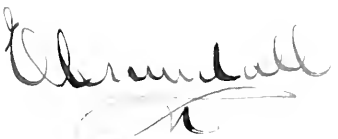

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TWELVE LECTURES

ON THE

FORM AND ACTION

OF THE

HORSE.

BY WILLIAM PERCIVALL, M.R.C.S. & V.S.

Veterinary Surgeon in the First Life Guards;
Licentiate of the Apothecaries' Company;
Author of "The Anatomy of the Horse;" "Hippopathology," &c.

WITH EIGHT ENGRAVINGS ON STEEL,

BY JOSEPH LAWRENCE, M.R.C.V.S.
H.E.I.C.S.

"La forme du Corps Vivant lui est plus essentielle que la matière."—*Cuvier.*

LONDON:

LONGMAN, BROWN, GREEN, AND LONGMANS.

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These Twelve Lectures were originally written for "*The Veterinarian*," in which journal they were serially published in the course of the years 1842-3-4. Additional copies of them were struck off the press at the time of printing: the same are now republished in the present form; the only alteration they have sustained—were, indeed, capable of sustaining—being the addition of some plates of the figures of horses, the intention of which is, to exhibit, in outline, the different parts composing the exterior of the body and limbs of the animal, to shew their relative situation and connexion, and to throw some light on the various movements resulting from their reciprocity of action. In the absence of any systematic treatise on this comprehensive and inviting subject, it is hoped these "Lectures," roughly and runningly sketched as they have been, may induce persons engaged among horses to bestow some reflection and study on a branch of science which too many are apt to suppose comes of necessity to them (as it were through instinct) with the possession of a horse. Moreover, it is conceived that, at a future day, they possibly may prove useful to some writer or lecturer about to undertake the exposition of the principles upon which the science of external conformation, and its consequent action, is or ought to be founded. There being no possibility of correcting the sheets composing the work now, the author prefers craving for their *errata* the indulgence of the reader to the publication of any—which might be a lengthy—catalogue of them.

56, Gloucester Crescent, Regent's Park.
August 1850.

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LECTURES ON HORSES.

LECTURE I.

FORM AND ACTION.

"A horse! a horse! my kingdom for a horse!"

WHEN Richard in the heat of battle made use of this soul-stirring exclamation, I take it he wanted a horse with form, and fire, and action, such as England alone, no less perhaps in those days than the present, could furnish him with. In what other part of the world could the *Hotspur* spirit of Richard have been suited? or where could he have met with an antagonist well enough mounted to have required such a steed to oppose him with, save in Britain? Exists there in any other country cavalry equal to our own? Can a horse of any foreign breed out-run the English racer! Acknowledgedly in possession of the finest and fleetest horses in the world, is a proof—and a pretty convincing one—that our management concerning them, in a practical point of view, has attained a degree of eminence of which we may justly feel proud; and yet in veterinary and equestrian literature we appear to be behind France and Germany, and, perhaps, Italy too. We have several modern books on veterinary medicine—we have some on anatomy; but we lack one on what is commonly called "Exterior Conformation:" this want I propose to use my humble endeavours in the present lectures to supply.

Animal bodies have been compared to works of art—to machines and engines of various descriptions. Such comparisons, at the same time that they manifest their boundless inferiority to their great prototype, have still had their use in serving to explain and elucidate the structure and operations of that most curious and delicate and wonderful of the productions of Nature,—an

animal machine. Simple and uniform, and beautiful in appearance, as are the exteriors of Nature's organic creations, their interiors are in truth, in the sublime language of the psalmist,

"Fearfully and wonderfully made!"

Such is the complexity and intricacy of the animal fabric, that, notwithstanding men of the greatest sagacity and spirit of research have, from the earliest ages, laboured in developing and explaining it, there still remain parts of the body whose structure is concealed in mystery; and as for the connexion subsisting between body and mind, anatomists and physiologists of the present day are hardly more informed than were the metaphysicians of former ages.

"Through the dis-closing deep
Light my blind way: The mineral strata there
Thrust blooming. Thence the vegetable world,
O'er that the rising system more complex
Of animals, and higher still the mind."

Whenever a man has elaborated any complex or delicate piece of machinery, in order to preserve it he incloses it in some sort of case: in this he does but imitate Nature, who has furnished all her organic productions with complete tunics or cases—some of one kind, some of another, but all pleasing to view, and most completely effectual for the purpose of protection against such external agency as must of necessity be encountered. This covering—commonly called *skin*—is that which composes the *exterior* of the animal. But Nature does not stop here. In addition to a skin she has given a sort of clothing to animals: some she has covered with scales, some with feathers, some with wool, some with hair. From the observations Lord Byron made in the course of his travels and residences abroad, he was led to believe that even the hair of the head of a woman, if suffered to grow to its natural length, would in time serve as a vesture for her body. Man, in a savage unclothed state, would no doubt appear in some such natural pilous garb as that in which Orson is pictorially represented.

There is not only a difference in the material furnished by Na-

ture as a clothing for animals, but there is an evident difference in the quality or texture of the same material, according to the breed or variety of the species: compare the coat of the cart-horse with that of the racer, or rather contrast it with the satin dress of the Arabian, and this difference will at once be manifest. Though there are, however, these striking and obvious distinctions as regard the species, a great deal concerning texture or quality of coat depends upon climate, soil, domestication, &c.

The outward form of the animal is regulated by the construction of the interior of its body; and since we take this in all cases to be that which is best suited to answer the ends of its creation, it follows that no other form or shape for that peculiar to the animal could have been substituted. The form of the fish is that best adapted for suspension and swimming in water; that of the bird for suspension and flying in air; that of the quadruped for fleetness, or for travelling under heavy burthens upon land; that of man in his capacity as

"Lord of the creation."

But form admits of division into *size* or *magnitude*, and *shape* or *symmetry*; and as we have seen that the shape of every animal is that which proves most conducive to its design, so we shall find on investigation that the *size* of the animal, so far from being an affair of chance or accident, has likewise been considered. The animal creation presents examples of every conceivable variety and degree of magnitude—from the mite, discernible only through the microscope, to the stupendous elephant and astounding whale. Shall we call this a freak of Nature? rather, shall we not discover in it *design?* yea! and design most ingeniously worked out to answer the various ends for which the different creatures were created. Was not the elephant made of gigantic size in order that he might possess surpassing strength, to enable him to travel under enormous burthens? On the other hand, was not the mouse formed diminutive to render it light and agile, and apt to run into holes, and chinks, and corners, to elude its pursuers?

This brings us to the consideration of a law of Nature regarding magnitude,—that great bodies move comparatively slowly or with difficulty—a law which, though not strictly measurable by an arith-

metical scale, is nevertheless one that, in the animal kingdom, will be found pretty generally to apply. Compare the tardy and tedious march of the elephant with the nimble-footedness of the mouse; the sluggish walk of the cart-horse with the amble of the pony; the heavy step of the grenadier with the light active trip of the little man of business; and in every instance there will appear some exemplification of this law. Is not this enough to shew that the height and bulk of animals has not been a mere affair of chance or accident, but a principle of design for wise and benevolent purposes? Is not the large cart or dray-horse as useful a creature in his way as the racer or the hunter, the cob or the pony? Could any one of these completely supply the place of the other? Could the racer drag the brewer's dray?—the dray-horse run the racer's course?—the pony carry the cob's twenty-stone weight? It is, now-a-days, notorious enough among "judges of horses," that size and bulk are indispensable for the carriage of heavy weight and for the draft of heavy carriages: a slender-made horse, however intrinsically good he may be, cannot perform in such situations.

We must take care, however, not to run away with the impression that, in animal structure, capacity, or what is called "goodness," increases in direct ratio with greatness. When it does—which is only now and then—nothing short of the same size and volume can prove equivalent to it. Every horseman well knows that "a good big horse" will always beat a good little or less horse, the difficulty being to *find* the former. Everybody has a good pony. There hardly ever was known a bad one. But how few persons have possessed good sixteen or eighteen-stone-carrying hunters! Our best racers and hunters have all been *great* or *big* horses—horses 15.2 or 16 hands high, and large in proportion. Need I mention the names of Selim, Reubens, Castrel, Sorcerer, Soothsayer, Voltaire, Charles XII, Middleton, Velocipede, Camel, and, last and greatest of all, Harkaway!* or need I say to my reader,—"go into Leicestershire, and look at the hunters there, and you will see my observations amply enough verified?" So that, when goodness is combined with greatness, perfection is nearer approached than in any other form.

* The following mares were equally remarkable for size and excellence:—Altisidora, Fleur-de-Lis, Queen of Trumps, Crucifix, and Orelia.

When I speak of largeness or bulk, I am not meaning *fatness:* a fat horse is a proportionably weak horse. *Adeps,* or fat, is an oily matter, itself unendowed with life or sensibility, contained in cells, as honey is within the honey-comb, which are vital, and so endowed that they have the power either of adding to or taking from the quantity of oily matter at any time existing. The use of fat is to fill up crevices in the body, facilitate the movements of parts one upon another, and serve as a sort of internal nutriment, in case the animal should be in a situation where he cannot obtain food: but, when it accumulates, instead of facilitating the motions of parts, it clogs and impedes them, and becomes, from its collected amount of weight, a burthen to the body. A fat horse is not only unfit to go, but really has a weight within himself to carry which the horse in condition for work has been disencumbered of. A fat horse will not bear the loss of blood the same as a horse in a working state of body; the one will faint from the abstraction of a quantity which the other will stand without being affected. Plumpness, which arises from fatness, is too apt to convey to the eye of the inexperienced the impression of strength and ability to go to work; whereas it ought, I repeat, be taken as a proof to the contrary. When a purchaser enters a dealer's yard to buy a horse, every horse shewn him, most likely,—certainly every horse four or five years old,—is fat, and therefore not in a condition for work. Dealers, by quantities of manger-meat, bruised oats, hay-chaff, &c., and by giving their horses only such little walking exercise as serves to keep their legs from filling, make the horses they have for sale as fat as they can, and for two reasons:—1st. Fat fills up the crevices, and conceals any imperfections there may be of outward form: it is the horse-dealer's putty; by it, like the coach-maker, he makes his article for sale appear more perfect, or freer from defects, than it really is.—2dly. By it he gives an appearance of size and bulk to the articles, which passes for signs of strength and ability, but which, as I said before, is in reality an indication of weakness. No men are better aware of the disadvantages arising from the presence of fat than trainers and jockeys. "Such a horse is too fat to win his race," is a remark not seldom heard, even at the starting-post on the race-course; when all signs of obesity, it is expected, have—or most assuredly ought to have

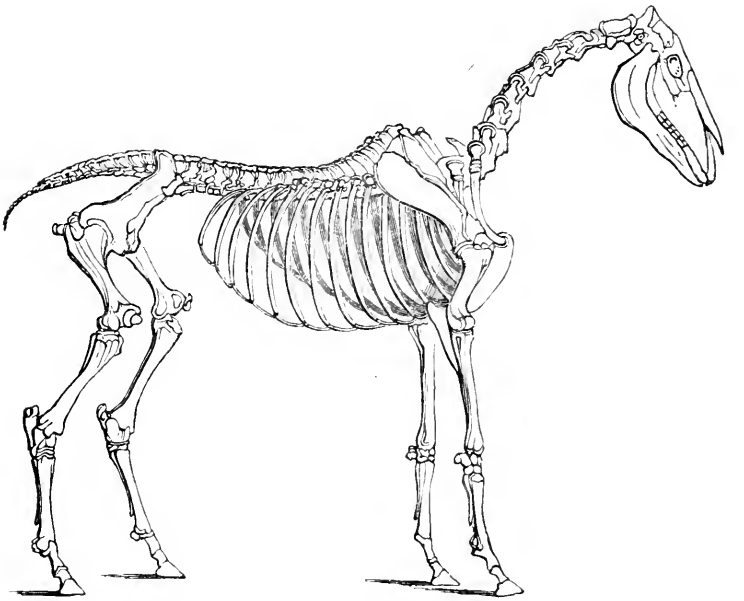
—vanished. How many hunters are there distressed—shall I say killed?—at the beginning of the hunting-season, or before Christmas, to what there are afterwards? A "judge," going to view a hunting stud, feels the horses upon the ribs and along their crests, and pronounces, at once, one to remain too "gross" or fat, another to have been over-reduced: his experienced eye and hand telling that in the stable which to another only becomes discoverable on actual trial.

In young horses, the *adeps* or fat is mostly deposited upon the external parts,—upon the superficial muscles,—and is, consequently, found immediately underneath the skin; but horses seven or eight years old, and upwards, are very disposed to accumulate fat inwardly—about the kidneys and bowels, and upon the belly, internally. A horse may evince very little fatness outwardly, and yet be loaded with fat "in his inside." Fatty matter deposited among the fleshy parts or *muscles* of the body, and between their fibres, renders them loose in texture and flabby in feel; the adeps occupying that space which, in the horse in hard condition, is filled with clean muscular fibre.

The good great horse is not made up of fatty substance. He has large bones, large joints, and large muscles; and in these, and these alone, consist his superior physical powers. This skeleton is of large dimensions. There is evidence, in the length of the bones and in their bold and prominent projections, of considerable leverage. The muscles distributed upon it have evidently had every advantage of action, their further power depending entirely upon their own innate bulk and composition.

The time is now arrived for us to take a view of the fabric and mechanism of

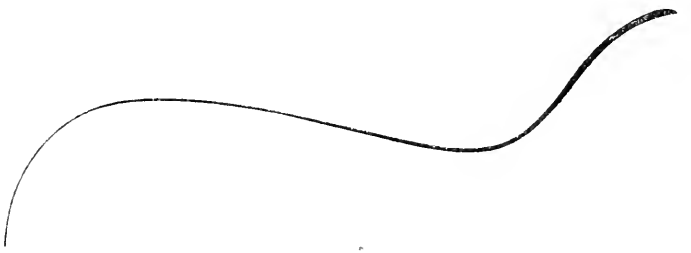
THE SKELETON OF THE HORSE.



The bones of which the body is composed, divested of their flesh or *muscle* and other soft parts, and connected together in their natural order, constitute the skeleton or osseous fabric of an animal: to this the fleshy parts are attached, by it the bowels are supported and protected, and from different parts of it project levers, by whose means, through the agency of the muscles or moving powers, *locomotion* is performed.

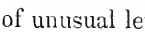
The contemplation of the skeleton of the horse—or, indeed, other quadruped—presents to the mind a figure too irregular to admit of any comparison save to the animal of which it once formed the framework. It is constituted of a part we call *the body*, but which is strangely deficient about the loins; supported by four columns *or legs;* and has attached to it, in front, *the neck and head;* behind, *the tail.* This is the view the superficial observer might take of the skeleton; but it is not the view which will answer the ends of science, or convey to our mind those notions of its fabric upon

which must be founded our philosophy of its uses and operations. Let us commence at the *occiput* or hind-head, and we shall find a continued chain of bones, termed *vertebræ*, extending from it, forming the bone-work of the neck, and back, and loins, and tail: altogether—comprehending its entire line—having something the figure of a double *ƒƒ* turned lengthwise and united, in this manner:—



An artist would say, "Why this is precisely the superior outline of a horse." *We* must regard it as the *key-stone* of the edifice—the great bond of union of the two sides or halves into one whole. It is the most important part of the structure. It is composed of no less than thirty pieces, called *vertebræ*:—seven in the neck, eighteen in the back, five in the loins, with the addition of the croup and the tail; and these are united one to another by an elastic gristly substance, to the interposition of which is ascribable that pliancy and flexibility which the *spine*—for so this chain of bones is called—in the living animal is known pre-eminently to possess. The sinking down of the back under the imposition of weight at the time that the rider mounts—the springy and easy seat the rider finds in the hollow or middle of the back, and the self-adjusting power of the spine to the various inflexions of the body, are all attributable to this property of elasticity which the vertebral chain derives from its thirty gristly inter-layers. Supposing it had been from beginning to end one undivided piece of bone, what would have been the consequence? Why, that the animal could have possessed no flexibility either in his neck, back, loins, or tail, and must, therefore, have moved about upon his legs, stiff in all these parts, as though he were affected with *tetanus* or locked-jaw. As it is, there exists a little yielding, a very little, between every two vertebræ; but this, multiplied by the number of the vertebræ,

gives, as an aggregate, to the entire spine a very considerable extent of flexibility. There is, perhaps, no occasion on which this flexibility of the spine is better seen than at the time a horse is twisting his head round to bite himself, or scratch his cheek with his hind foot, unless it be in the remarkable bending evinced by an ass at the time he crawls under a low rail.

The figure the spine describes in its course is that, imperfectly, of a double S, or of two $\int\int$ of unusual lengths, placed horizontally, and united thus  . There appear two arcs formed by it, one at the upper part of the neck, another commencing in the back, behind the blade-bone, and running through the loins and croup to the tail. These, therefore, we may take to be the most resisting parts of the structure—the parts most capable of bearing superincumbent weight. In some horses these arcs are more conspicuous than in others. In horses with crested necks and roach backs they are most so; and such horses, on this account, are reckoned strong and able to carry a greater load. There can be no doubt but that roach-backed horses evince the greatest power under the riders: I have experienced it myself on many occasions. It is likewise, I believe, equally true that curved or crest-necked horses have augmented power in their necks.

An attentive consideration of the figure of the spine will shew the proper place for the seat of the rider: this obviously must be the part where the animal can best support his burthen, and yet not have his action in progression at all impeded. English horsemen are apt to sit in too forward a situation upon their horses; foreigners —Germans in particular—too backward. The saddle should be placed backward enough not to interfere with the motions of the shoulder-blade, and forward enough for the pummel to meet the rise or summit of the withers; the girths crossing at a sufficient distance behind the elbows not to rub against or fret them in action. In the living horse there is a dip in the back, greater or less, immediately behind the withers; a place the rider upon the bare back naturally slips into for ease and comfort, and particularly if he happen to be mounted upon a rough trotter. This, Nature seems to say, is the place for the saddle.

We have looked at the arcs or arches of the spine; let us now

take a view of the *dips*, or reversed arcs. There is but one, but it is a very remarkable one. It commences at the lower part of the neck, extends backward through the interspace between the shoulder-blades, and terminates where the spine emerges from behind the blade-bones. This must be the weakest part of the spine; and for this reason Nature has placed it in a situation where it cannot possibly have to support any burthen. No man ever dreamed of riding upon the summit of, or in front of, the withers. This remarkable dip, or downward curve, appears to owe its existence to the two arcs afore-named. Had the spine been constituted of one continued arc from end to end, the head must have been inflected downwards, without the power of elevation; vision no longer could have proved useful in directing the animal on his way; the back would have been of a most awkward form for the carriage of burthen; the cavities of the chest and belly of a most inconvenient shape and the limbs of enormous length. Had the spine been made straight from head to tail, no elongation of it, and with difficulty any shortening of it, could have been produced, the consequences of which must have been a great diminution of that elasticity and power of adjustment for which, in its present form, the structure is so useful and admirable. The beauty of the neck, the freedom of erection and depression of the head, the faculty of looking back and turning round with equal facility and rapidity, would all have been greatly impaired by a spine either directly straight or uniformly curved: in addition to which, none of the actions of the body, in particular galloping and leaping, could possibly have been performed with the same efficiency they are at present.

The arc of the spine forming the loins and croup is completed posteriorly by the tail, which, when of its natural length, considerably extends it, both backwards and downwards. Then here is another part upon which weight may be imposed with great advantage to the animal: the tail itself will assist in its maintenance, let alone its being placed immediately above the hind limbs or posterior columns of support; and the destruction of this arc, when the burthen is intended to be borne by it, forms, there cannot be a question, a decided objection to docking. Asses, we know, with

great apparent facility, and comparative ease, carry their loads upon their croups: docking, one would think, must tend to render this carriage difficult.

The *vertebræ*, or bones composing the spine, are exceedingly irregular in their figure, and remarkable principally on account of protuberances and projections growing from their sides and superior parts. The superior projections are conspicuous for their length, particularly those forming the withers. In fact, it is the length of these processes that regulates the height and fineness of the withers. Altogether, the protuberances and projections may be regarded as constituting a series of levers for the attachment of muscles, many in number and great in power, on which mainly depends the strength in action of the animal, as well as his capability as a beast of burthen.

I have already observed that the motions, although exceedingly limited between any two vertebræ, are pretty extensive in the entire spine, owing to the number of its component pieces. The spine was required to be a very strong and resistant structure; at the same time it was required to have the power of flexure and curvation, in order to accommodate itself to the various positions and movements of the body during progression; all which could not have been effected in the same piece of mechanism without a manifold division of its component parts. Whenever the motion between two bones is of an extensive or varied character, the liability to *dislocation* or displacement between them becomes great: the more completely the bones are locked or dove-tailed together, the more limited becomes the motion between them, but the more secure they are against liability to dislocation. Such is the admirable mechanism of the spine, that both these *desiderata* are insured.

THE BACK AND LOINS.

"The back of a horse, to be a good one, should sink a little below the withers, but the other part should never be too low, but always straight. When the back is higher behind than forwards, he is apt to be pinched in his shoulders, which makes him both weak and unsightly; besides, his hind parts are rendered so heavy thereby, that he generally has an awkward clumsy gait, and moves but slowly. If a horse's back is too short in proportion to his bulk, and yet he is in other respects well built, he may hold out pretty well on a journey, but such are generally slow, and never make a good appearance; but if at the same time he is tall, and has very long legs, his worth is but trifling. If his back is a little arched behind the saddle, it is a sign of strength, and shews fitness both for hunting and travelling."—*Farriers' Dictionary.*

THE strength of arched structures is well exhibited in works of art. Wherever the architect requires great strength and resistance he adopts the form of the arch. Between the columns of spacious buildings he extends arches, by which their walls are rendered more secure, in being bound together, and their roofs better supported; and in the construction of bridges across waters of any extent, he employs an arch, or a succession of arches. That wonderful work, the Tunnel underneath the bed of the Thames, consists of a series of united arches of substance sufficient to resist the pressure of the superincumbent body of water, which at high tide is estimated at an almost incredible weight.

With all the strength and power of resistance of the architectural arch, the arcs of the spine possess a degree of mobility, enabling them to alter their figure, to become larger or smaller, elliptical or circular, according as circumstances require: a property that could not be given to the mechanical arch without rendering it unstable and detracting considerably from its strength. At the same time it is worthy of remark, that, wherever there is any elasticity arising either from the kind of materials of which the arch is composed, or from the nature of its construction, it is invariably found to possess, in consequence, increased powers of resistance. A happy elucidation of this is seen in the common violin, which, when strung up to concert pitch, has been calculated to be actually sustaining a force equal to eighty pounds; under the pressure of which it would certainly break were it not for its arched form and

the elasticity of the material (very old seasoned deal) of which it is manufactured.

From their mobility the arches of the spine not only derive the requisite elasticity, but likewise that self-regulating power which, under all changes, preserves their equilibration or undiminished strength. Dr. Hutton, in his "Principles of Bridges," tells us that the arch of equilibration, i. e. the one which is in equilibrium in all its constituent parts, is the only one which admits of a horizontal line across its top, and, in addition to being both graceful and convenient, possesses the advantage of being made higher or lower at pleasure, with the same span or opening. He adds, that the elliptical form of arch approaches the nearest to that of equilibration for strength and convenience. How strikingly and beautifully is all this verified in the fabric of the spine, and how wonderful it is that the structure should be capable of preserving its equilibration under all the various changes of figure and span which its arcs must, in the movements of the animal, be continually undergoing! Who but "the Divine Architect of the Body" could have framed and finished such a piece of workmanship?

It must be manifest that the mechanical powers of the spine, regarded either as a fixed or moveable body, must be affected by its length: and that there exist considerable variations in the longitude of spines, must appear self-evident to any observer of horses: not that there are any additional bones in a spine of unusual length; but that the vertebræ are of larger size, and their bodies and intervening cartilages thicker. Some horses have very long backs and necks; some very short ones. Hardly any two have backs and necks of the same length; from all which result certain advantages and disadvantages. We will first consider the longitude of that part of the spine that forms the back, and in two points of view:—1st, as it affects the support of weight; 2dly, as it mechanically affects progression.

Regarding the dorsal portion of the spine with its super-imposed burthen as a pole or lever supported in front by the fore limbs and behind by the back limbs, after the manner of a barrel of beer or a sedan between its bearers, it is manifest that the greater its length the greater must be the leverage, and consequent reduction of the weight of the burthen. On this principle, the legs of

the long-backed horse are actually sustaining less load than those of the short-backed horse, even though their riders or burthens may be of equivalent weights, from the circumstance of their operating at a greater distance from the load.

But an important circumstance to be taken into consideration in the present case is the *flexibility* of the pole or lever—the fact of its being liable to *bend* under superincumbent weight, and of undergoing, in consequence, alteration in its figure, either from an arc to a straight line or to a reversed arc, whereby its mechanical powers become proportionably weakened. When a horse fails under too heavy a load, we do not find that it is the limbs that give way, but the spine. His back bends or *sinks* under the weight to the extent of its limits of flexibility, and then the limbs falter, and the whole machine succumbs. Did not the pillars of support yield either from Nature's warning, excessive pain, or from actual inability to sustain more, the spine would probably become fractured—not dissevered in its joints, for they are stronger than the bones themselves.

We now perceive the reason why horses with long and hollow backs are accounted *weak*. To a degree, they are so, beyond doubt: but it is a great mistake to suppose that horses for riding cannot be made too short in the back. Length in the back is attended with many advantages: the limbs have a lighter burthen to carry—the stride in progression will admit of being greater, and, providing the hind limbs have length enough to reach forward under the load, the facility of forward motion will be increased: the chief disadvantages of such increased longitude, in progression, being the inability of the hind legs to reach the proper fulcral points underneath the machine, and the operation of the additional length or leverage in turning. We often hear excellent practical judges of horses saying, "a horse must have *length* to gallop;" by which they mean *length of back:* and, providing the limbs are proportionate in longitude and power, the observation is one which experience will shew to be correct. How frequently do we meet with horses with long backs reported to be, not merely fast, but strong galloppers in heavy ground, and able to carry great weights. I have known even hollow-backed horses have this character. I remember a hunter belonging to Captain P—, of the Guards, one,

without exception, of the most hollow-backed horses I ever saw, and yet this horse, Captain P. who is

"A skilful horseman, and a huntsman bred,"

has, over and over again, assured me, was *in mud* a most capital horse after hounds; and, indeed, when we came to look at his points—when we perceived that he had loins broad and rounded, haunches fleshy, and thighs down to his hocks, it became no matter of surprise to learn that his powers, in spite of his hollowness of back, were so surpassing. Had he been made narrow and tucked-up in his loins, ragged in his hips, flat and thin in his thighs, and weak in his hocks, his hollow back would have proved an additional source of weakness to him, and rendered him, for all purposes where strength was required, all but worthless.

A short back is well adapted for the support of weight, and, from being combined with, as a sort of kindred make, broad loins and full hind quarters, is, with reason, regarded as a mark of strength: but it is disadvantageous for galloping. It will not admit of any great length in the limbs, for fear of their interfering with one another in action, or of one set over-shooting the other, and therefore, most wisely, it is combined with short legs, whose two strides amount to little more in extent than one of the long-backed horse's. Consequently, to keep equal pace, one horse must take three or four strides while the other is taking two. The short back is well suited to the dray or cart-horse, in whom we want not speed but strength; and strength not alone to bear burthen, but in draught. In heavy draught, in particular, length of body would prove disadvantageous to him, from the circumstance of the limbs being required to be longer and farther distant from each other, and from the step being greater than is compatible with the full concentration and co-operation of the bodily powers. The short step of the cart-horse or cob it is which enables him to husband and maintain his powers of strength while in action. A long step would, by the too great call upon those powers, tend to exhaust them; and, by repetition, render the animal incapable of proceeding with his load.

I have just observed that when the back is short the loins will be found to be broad and strong—what is called, good; a circumstance arising from the circularity of the chest and the breadth of

the hips—these four formations, viz., shortness of back, circularity of chest, breadth of hip, and strength of loins, generally being found in combination. It is a great matter that a horse should have good loins, and when these are associated with a long back, and the requisite length and substance of hind quarters, we may take it for granted that the animal possesses both speed and endurance. Look at hares and rabbits, greyhounds, deer, kangaroos, and such-like animals, and note what thickness of loins, and length and muscularity of hind limbs they all exhibit; while their fore-parts amount to hardly any thing in comparative substance. It is impossible that a horse with thin narrow loins can hold in his gallop: the moment he puts his feet in dirt, that moment will he fail. It is the good loin, as I said before, that can—and the only point that can—compensate for hollowness of back. The horse I quoted as, though hollow-backed in the extreme, being an extraordinary hunter, had one of the finest of loins; from which we practically learn that, when the loins are good, not length, nor even hollowness of back, are to be accounted objectionable points.

It is nonsense to pretend to prescribe that the back should be long or short, of this length or that; although we may, in a general way, fall in with the common description of what a back ought to be, and say, "that, to be a good one, it should sink a little below (behind) the withers, and then run straight." The back will be too long or too short, or (though, to the observer, of unusual longitude or shortness, still) of the proper length, depending upon the formation and dimensions of other parts with which, in structure and action, it is associated. A long back would ill accord with short legs, defeated in their operation—a short back would not require long legs, they would do too much for it. We have, therefore, long-backed horses and short-backed horses, and yet with backs of proper length: because the longitude, whatever it may be, is that which is the suitable length for the machine of which it forms a part. A very common, but not the less, on that account, reprehensible custom among "judges of horses," is to find fault with a point, without any reference whatever to the general or particular conformation with which that point is consorted. Abstractedly considered, it may be out of proportion; but considered, correlatively, with out-of-proportioned other parts in the same frame, it may be

in the best proportion, or of such proportion as serves to compensate for faulty dimensions in other parts. A part most faultlessly fashioned and proportioned may—placed among certain other ill-formed or out-of-proportioned parts—appear itself to be the faulty piece in the fabric. In an animal body, as in machines made by man's hands, the great object to be sought for is *harmony* between the constituent members: at the instant, we are not hastily to condemn any apparent disproportion, lest, on critical examination, it should turn out to have been given for the purpose of compensation—to make amends for some defective structure elsewhere, which may not at first sight have struck our attention.

LECTURE II.

THE NECK.

"With neck like a rainbow, erecting his crest."

THE neck being the part to which the head is affixed, and by which it is attached to the body and supported, its shape and proportions will necessarily admit of a good deal of variation, according to the size and setting-on of that appendage. Viewed in the skeleton, the neck appears a very slender and inadequate structure to support such a formidable and bulky substance as the head; and truly inadequate to such a burden would it prove, were it not in the living animal aided in its functions by two powers of considerable influence and importance—one *elastic*, the other *muscular*, in its nature. The striking difference in the aspect and volume of the neck in the anatomized and living animals, will shew how great is the proportion of soft parts—*ligament* and *muscle*—compared with the abstract osseous materials or component *vertebræ;* and when we come to consider the nature and economy of these soft materials, we shall find that hardly any of the weight of the head is actually borne by the *vertebræ* of the neck; although the bone here, as in other parts, must still be regarded as the framework and basis of the structure. So far, therefore, as the bone is concerned in the support of the head, it matters little what the form and dimensions of the neck may be; its length and figure and substance having reference chiefly to the operation of the muscular and elastic powers.

A neck disproportionately long will, according as it is well or ill carried, detract more or less from the symmetrical beauty of the fore parts: at the same time that it is operating in rendering the head more burdensome than if it were a shorter projecture from the body, on account of the increase of leverage. A favourite exclamation of Professor Coleman's was, "Give me a horse that will starve at grass;" thereby meaning, a horse having a neck so short that, from not being able to reach the grass, he was incapable, or nearly so, of getting his living by grazing. Such extreme and disproportionable shortness of neck, however, although advantageous in the light in which it was viewed by the Professor, viz. decrease of leverage, is on some other accounts by no means desirable. It is perhaps an objection to a horse with a very short neck, and legs at all long, that he cannot but with difficulty get his living by grazing; but a greater objection to such shortness is, that a horse so made can hardly by any training in the manege be made to ride well. The neck is too short and too thick—the two properties generally go together—to admit of the required flexion, and the consequence is, the head cannot, by any perseverance in reining or bitting, be drawn into its proper position. The horse will ride *piggishly*—go boring forward, perhaps with his nose out, and make that sort of continual dead pull on the hand that gives his rider the sensation of his inevitably falling down at the first blunder in action he happens to make. A horse's neck that is short is not only, commonly, broad and thick as well, but, moreover, is combined with strong shoulders, thereby rendering him a great deal more fit for the harness-collar than for the saddle: such shortness and thickness in the neck, and strength in the shoulders, being for harness attended with many advantages. The *bull-neck*, as it is called, is proverbial for strength, and strength of a kind which appears well adapted for draught. In Spain and Portugal the oxen are yoked to the bullock-cars by their horns, which by leathern thongs are lashed to the pole of the car; and thus, by strength of neck alone almost, do they move forward with their loads, and, to appearance, with as much facility and effect as though they were—as in our own country—in harness-collars. Nothing can demonstrate power in the neck better than this; at the same time that it shews us that the commonly received notion, "the neck should be *lean*," is erroneous.

Such thinness or leanness may prove admirably suited for flexibility, and be the means of the horse reining-in and riding pleasantly; but for every purpose of power, for endurance, for guarantee of bodily strength, a broad and muscular neck is a point to be sought after and valued.

But the neck may be long, and yet its carriage may be such as shall counteract any increase of leverage. In the horse "with a rainbow neck," although his neck may be by actual admeasurement equally long with that of another horse who carries his neck quite straight, yet will the leverage of the head be altogether different. It will be seen, on a review of the skeleton, that the lever, in a well-carried head, does not run in a line parallel with the neck, but extends diametrically across the curve of it; proving that the neck, though long, does not in point of fact—so long at least as it be well-carried—add any thing to the leverage.

There are circumstances, however, under which increased length with straightness in the neck, however inelegant it may be, appears even to be productive of advantage. It seems to me that the preponderance of the head in the forward direction must have some influence in facilitating progression at the time that the horse is flinging himself forward in his gallop with all his might; and in order that it may have this effect the more, he projects his head while galloping to the utmost, and inclines it to the ground. I know very well other ends are answered by this straightening of the neck and protrusion and declination of the head, but this nowise militates against the operation of the gravity of these parts in that sort of swinging or leaping action of which the gallop consists. This accounts for length in neck being considered desirable in a racer, and for his always making the most of it in running, carrying his head in that thrust-forward position that his muzzle is the foremost part: hence the report that a horse has won his race "by a nose" becomes literally correct. This demonstration of the utility of a long and straight neck reminds us once more that, in regarding the conformation of horses, it is our duty ever to bear in mind of what breed or kind they are, and for what purpose they are by nature or art intended. In a hackney, nothing is more unpleasant than a long neck so straightened that the rider in vain tries to rein the

head in; in a race-horse the same appears to be attended, in his speed at least, with advantage.

The most undesirable form of neck of all others is what is called *the ewe neck*. Very often this is a natural deformity, appearing to consist in extension of the dip or reversed arc* of the cervical portion of the spine: oftener, however, I believe, it will be found to owe its production to the harsh and fruitless efforts of art "to get the head up or in," when the neck is of that description that will not, naturally, admit of it. Such constrained erect position of the neck and head is not only exceeding unsightly, but is irksome to the horse, and to his rider as well, who has, by continual workings with his bridle-hand, to keep the head in this forced erect posture. It is of no use trying by bitting or riding, or any course of manege, to alter a natural ewe-neck: no pains or perseverance can ever render a horse so formed pleasant to ride.

THE HEAD.

"The head of a horse should be narrow, lean, and not too long; but the principal matter to be observed respecting it, is, that it is well united with the neck, that so the horse may be enabled to bring it into a good position: and the best position in which a horse can possibly hold his head is such an one as is perfectly perpendicular from the brow to the ground, so that, were a plummet to be suspended from that part, it would just raze or touch the nose. Every horse that has too large a head is apt to bear too hard on the bridle, which not only tires the rider's hand very much, but exposes both to several very disagreeable accidents; and, besides, a large headed horse cannot appear to any advantage unless he has a very long and well-turned neck."—*Farriers' Dictionary.*

THE spine affords us an example of a structure both supporting and supported: at its fore extremity the head is supported by it; at its hind, the tail; in the middle it supports the chest; while itself is supported by the fore and hind limbs. The head appended to the extremity of the vertebral chain is mechanically operating by its gravity the same as any dead weight placed at the end of a long lever; for which reason, though a long neck is *per se* objectionable, yet are there, as we have seen, some circumstances which may tend to mitigate, and others that will tend to nullify, these objec-

* Already described at page 10.

tions. A large head will, of course, render length in the neck less desirable; but even in this case much will depend upon the manner in which the head is "set on," and upon the mode in which it is carried, and something upon the form of the head itself. A sort of slang reply used by horse-dealers when any purchaser objects to a horse on account of the size of his head, is, "Oh, never mind his head, sir! he carries it himself." An apophthegm which, vulgar and absurd as it appears, like the motto in the old song, "means more than it says." For the dealer means his customer to understand that the animal is *capable*—possesses the power in his neck—of carrying his head without trouble to himself or inconvenience to his rider; and that, therefore, his big head is in point of fact not an objection to him, or at least only so far as regards its appearance.

Abstract size of the head is of less consequence than the carriage of it; and, in order that it may be well carried, the head must be properly "set on." Upon this depends the power of getting the head into the proper position. When the head is properly set on, and the neck of adequate length, the riding-master's task becomes comparatively facile and pleasant: for such a horse Nature has done what he by art in vain endeavours to accomplish for a horse of an opposite conformation. In making these observations I am fully aware how much for the better horses having faulty conformation in these respects may, by a judicious system of manege, be improved: I know that they may, and to a greater degree than people in general imagine; at the same time I shall not be contradicted when I affirm, that there are necks straight or ewed, with heads set on in that fashion, that will defy all the riding-masters in Christendom to get them into a proper position, and make such horses ride in any tolerable form.

There is a great variety in the size and shape of horses' heads, and the indications they afford are no less unerring than useful to us in determining breed, qualifications, &c. The head may be of that ordinary magnitude and suitable character that attracts no particular notice; or it may be disproportionately *large* or *small*, or out of proportion in some of its parts; or such as is accounted *handsome*, or *plain*, or *ugly*; or such as denotes *kind* or *breeding*, or any *particular breed*, or *nationality*.

A LARGE OR BIG HEAD is generally regarded as unsightly—

as detracting from the beauty of its possessor, or actually rendering him plain or ugly, and, consequently, as a sufficient reason to reject the purchase of such a horse. It does not follow that, because a head is large, it be plain or ugly, although we shall very often find these qualities combined: a coarse, vulgar, large head, with a countenance possessing neither breed nor sagacity, but rather expressive of ill-temperedness, is certainly enough to condemn the unfortunate owner of it, be his other qualifications what they may; but a head which, although large, shews shapeliness, and some breeding and sagacity, and withal has a good-tempered front, ought not to be despised on account of its magnitude. A frequent accompaniment of a large head is, what is called,

A ROMAN NOSE; and this, with many persons, constitutes an additional objection to it: for my own part, however, I do not carry dislike to this formation so far as is commonly done. I do not think, myself, that roman-nosed horses are in general ill-tempered, although low bred; nor have I found them inclined to vice: indeed, I can call to mind instances in which horses with such heads have turned out very good of their kind. It is, however, as being the very reverse in form of the blood or Arabian head, a decisive mark of low or rather no breeding, and therefore can only be tolerated in half or coarse-bred horses.

A SMALL HEAD is almost peculiar to the well-bred horse: we rarely see it unless in conjunction with breeding; and yet there may be a vulgarity about its make and expression which, were it not for its diminished size, we should consider rank and objectionable. It may have neither the forehead, nor the muzzle, nor the jowl, of the true blood head. In a racer such would be regarded as vulgar, and give rise to suspicions of pedigree; in a half-bred horse its smallness might, and probably would, tend to enhance his estimation; though, when the countenance did not warrant it, very likely most unjustifiably. Generally speaking, however, a small head turns out to be

A BLOOD HEAD—that which the nearest approaches *the Arabian*, and yet has now become so congenerous with, and characteristic of, our own breed of race-horses, that it may be said to be the peculiar attribute of the *thorough-bred* horse. Of all heads this is the one to be lauded and valued. There can be no doubt about *family* when this

makes its appearance. At the same time that it possesses breadth and fulness in parts where capacity is needed, it is so "lean" every where, that every subcutaneous vein and muscle may be distinguished through the skin. Ample across the forehead, wide between the ears, small and yet expanding at the muzzle, capacious in throat, and broad though elegantly curved at its junction with the neck, the head of the racer is at once perfect and beautiful, and full of expression, and fire, and sagacity. Blood and action, speed and bottom, are all the natural attributes of a horse having such a head; and though these brilliant qualities may be in a measure sullied by temper, still, in a general way, this is the head that is to be regarded as emblematic of all that is good and valuable in the horse species. For all this we stand indebted to the Arabian, the *radix* of our blood stock: although we have, it must be allowed, greatly improved upon the original breed, still for our present unequalled turf-horse are we as much in debt to the Arabian as the farmer or the horticulturist is for his improved vegetable productions to the exotic or graft from another country.

We have been considering the most eligible size and shape, or kind of head; but we have said nothing yet about what, perhaps, is of more consequence than either its magnitude or form, or what, more properly speaking, may in a measure comprehend both, viz. the *face* or expression of the head—the *countenance* of the horse, if I may be allowed the phrase. To persons not conversant with or observant of horses, it is quite incredible what an endless variety there is in this respect; almost as many shades of difference as exist in the human countenance. Take, for example, the Household Brigade of Cavalry, all blacks, and nearly a thousand strong, drawn up in line, and examine with philosophic eye the horses' faces: no two will be found alike; every individual will present his own peculiar expression; and by that look, always indicative of property or propensity of some sort, will he best be distinguished out of a herd of other horses of the same colour. The common mode of distinguishing horses is by colour and marks, and size and shape, and so forth; but this is not the true unerring characteristic: that is to be found in the face alone. In many animals there is an evident difference between the countenances of the male and female; a remark that holds good with horses so long as they continue un-

castrated, but not with geldings deprived of their testicles at the very early age they commonly are. I have on numerous occasions essayed to determine the sex of a horse—gelding or mare—by examining the face when first confronted with the stable door; but I have found myself in error too often to think of drawing any distinct traits of difference between their countenances, and have been forced to confess I knew not whether I were looking at a mare or a gelding. Still, a great deal more information than appears to be imagined may be gleaned from a happy knack of catching the expressions of horses' faces—the science of *horse-physiognomy*.

I possess an esteemed acquaintance on the turf—a gentleman whose judgment in the choice of a racer, by everybody intimate with him, is on all occasions appealed to—who will not purchase a thorough-bred horse unless his countenance be such as he approves of. An ill-visaged, bad-tempered looking horse he invariably declines at any price. His common practice in selecting racers out of large studs is to have the horses for sale brought first to the door or window of the stable, to give him an opportunity of surveying their countenances; after which, he only sees out such as he has in physiognomy found faultless.

I remember one day, while in Ireland, accompanying my friend from Dublin into the country, in a buggy, to his chateau, when, as we were riding along, I perchance observed to him, what a pretty foal was running by the side of a thorough-bred mare in a field by the road-side. "Yes," replied he; "and that foal looks to me as if he were got by ———," a racing stallion then in England. "How can that be," said I, "when the horse is not in this country?" "Why," returned he, "the mare must have been imported in foal." "Oh, then I suppose you know that to have been the case." "No! indeed, I know nothing further than that the foal's face has the identical expression of the old horse's." "Then you really must excuse me, saying, that it appears to me you are forming an opinion of the sire of the foal upon very slender grounds." "*Slender* as you suppose them, I will make you a wager of a guinea they prove correct." "Done!"—The way to settle the dispute was ready enough: the farm-house of the property lay about half a mile out of the high road. Thither we drove; saw the proprietor, a stranger to both of us; and from him learnt, to my surprise and

loss of my wager, that the colt was got by the horse named, the mare having been purchased in England and brought over in foal.

This little anecdote will serve to remind us, as connoisseurs in horses, that we are not in the habit of paying all the attention we ought to the heads of horses, and in particular to that part of them we call the face. We are told, the *countenance* is "the peculiar property of man"—is the mind pourtrayed in the face: call it what we may, however, there is in every brute an expression of face peculiar to him or his kindred by which we may not only recognise him better than by any other distinctive character, but in a very great degree judge of his temper and capabilities The large head not infrequently possesses a face whose aspect is recommendatory, or of a character so open and good-tempered as to assure us of the tractability and willingness of its possessor; circumstances under which it would be wrong, unless it were in the case of a race-horse, to object to it. I have known a great many good big-headed half-bred horses—hunters, roadsters, &c.—with faces of kindly expression: at the same time I must join in the universal anathema pronounced upon big, *ugly* heads, and particularly when combined with sour, ill-tempered countenances.

The head includes within it three great cavities or compartments:—one occupying the summit, forehead, and temples, for holding the *brain;* a second, extending from the forehead to the muzzle, including the fore part of the face, for containing *the apparatus for smelling;* a third, known as the mouth, in which are fixed the instruments for *the mastication of the food:* in addition to which the head furnishes lodgment for *the organs of sight and hearing*—the eyes and the ears. The throat, likewise, is a part of very great importance: it includes the *larynx,* the entrance-door into the windpipe, and a fulness hereabouts, externally, is an indication that this aperture is of ample dimensions, and well-constructed for the purposes of respiration: in other words, a full throat or throttle is one of the signs of "good wind." In fact, as a general observation, we may assume, that the capabilities of parts are, *cæteris paribus,* commensurate with their development. The Arabian or blood head, affords a good illustration of this. Its noble broad forehead vouches for an ample share of sagacity; its promi-

nent nose and dilated nostrils, coupled with fulness about the throat and width across the jowl, shews that ample provision has been made for the olfactory, respiratory, and manducatory apparatus: so that, small as the blood head at first view appears, it, in point of fact, is large, or rather capacious, in every part where development of the contained organs is required. Thus, that which is set down as the handsomest of heads, turns out, on examination, to be the most serviceable of heads: in this, as, indeed, in most—in all—other instances in the animal economy, utility and beauty go hand in hand.

THE MUZZLE, as all the inferior or most dependent part of the head is called, including the nostrils and lips and mouth, is very characteristic of the breed or species. Observe what a difference exists between the muzzles of a low and a high-bred horse: the one, broad and flat and mean-looking, emerging from a line more or less convex down the front of the face, and curving down into the upper lip, with nostrils over-lapping, and their contracted entrances beset and almost closed by long hairs: the other, small enough, as the saying is, "to go into a pint-pot," with every part boldly marked, and its outline, instead of a curve, being straight along the front, or from about the middle of the face, inclining forward or outward even beyond the perpendicular of the line of the face, and, instead of declining, ending abruptly in a prominent point, from which it turns sharply down, at a right angle nearly, to form the upper lip; the nostrils at the sides standing open, with their scanty borders seemingly insufficient to cover them, and with hardly any hair at their entrances. It is difficult to sketch these differences in words: a drawing might serve to elucidate the description; but, to thoroughly understand all that is said, the living subjects themselves must be consulted. The muzzle is a part very characteristic of breeding; so much so that, when other points are dubiously developed, great reliance may be placed upon it alone.

THE EYES strike the most superficial observer as tokens of breed. Everybody has noticed the difference between the eye of an Arabian or English racer, and that of the half or cart-bred horse: the bold and decided brow, and full gazelle eye of the

former, cannot fail to attract attention. But there is a very great variety in eyes, and in the expression given by them; hence one reason for the interminable differences in the countenances of animals. I cannot say, myself, I admire an over-full or exceeding prominent eye; there is a sort of unnatural expression about it which I have often fancied has turned out to amount to—what grooms call—"foolishness," and I have, more than once, imagined such horses to be near-sighted. Opposed to this, we meet with the small, sunken, dark-looking eye, which creates a suspicion about temper, and particularly when an expression of what is called "sourness" is to be observed in it. I have seen several instances of viciousness in horses with such eyes, and therefore am I biassed against them; at the same time I have known horses with such sour, ill-tempered-looking eyes, after having been cured of their vice, turn out the very best of their kind. I remember well a dark chestnut horse my father purchased of Dyson, after he had been rejected by the Artillery as a trooper, at the price of £30: he had what are called *pig-eyes*, and a more restive, ill-tempered horse, perhaps, never existed. However, by dint of perseverance in long and daily rides by a bold and fearless horseman, his rebellious spirit was at length subdued, and ultimately he became quiet and tractable enough "for a child to ride;" turning out such a hunter as no fence could stop or the longest day tire; and being sold to Mr. J. Nicholl for £90, who afterwards refused two hundred guineas for him—any price that could be offered, in fact—in consequence of his turning out about the very best horse in the *Berkeley* hunt.

There is a notion abroad, that a horse who shews "the white of his eye" is inclined to be vicious; and, like most other notions of the sort, this appears to have had some truth for its foundation, though the truth has been somewhat distorted in the deductions. Some—very few—horses shew the white of their eyes naturally*; many do so by a habit of turning their eyes upon any person approaching them, and particularly in their stalls; which glance

* Animals in general shew only the transparent part of the eye: man and the hog disclose the white of the eye.

askaunt necessarily discloses more or less of the white of the eye. Now this oblique or retrospective cast of the eye may certainly be—and mostly is, perhaps—accompanied with some thought or intention of biting or kicking; but, on the other hand, it may be the effect of habit, of a playful disposition even, and so may not portend any evil. I have met with many cases of both descriptions, where vice was and where vice was not present; but I cannot add, I have encountered such a majority of the former description as to pronounce "shewing the white of the eye" an infallible indication of a vicious disposition.

Before I conclude this Lecture, let me recommend to the notice of my reader the study of *horse physiognomy:* it will, as a horseman or veterinarian, repay him for any time and attention he may bestow upon it; he will find in it the only infallible criterion whereby to recognise an old servant or acquaintance; to enable him to distinguish one horse from another; and, at the same time, will derive from it that sort of discriminative knowledge which will give him considerable insight into the propensities and qualities of horses, even before any opportunity has been afforded him of making trial of them. To the acquirement of such knowledge an extensive field for observation is essential, with opportunities of becoming acquainted with the tempers and characters of horses; and, even with these opportunities, it is only by a daily collection of facts, and by deductions cautiously and tardily drawn from them, that we can expect to arrive at any perfection in a science at the present day so undeservedly neglected.

LECTURE III.

THE BODY.

"In making choice of a horse you must take care that he has a good body, and is full in the flanks; for it is not one of the best signs when the last of the short ribs is at a considerable distance from the haunch bone, or when the ribs are too much straightened in their compass; as they ought to rise equal with the haunch bone, or nearly so." * * * "A narrow-chested horse can never have a good body, nor breathe well, and such horses as have straight ribs, and are at the same time great feeders, will soon distend their bellies to such a degree, that it will be impossible for their entrails to be contained within their ribs, so they will press down, and form what is commonly called 'a cow's belly.' These horses are difficult to be saddled, but have generally good backs; and though their croups are not so beautiful, being for the most part pointed, yet in recompence for that deficiency, they have generally excellent reins."—*Farrier's Dictionary.*

FOR convenience of description, the entire animal machine is divided into *body, neck, head,* and *limbs* or *extremities.*

THE BODY, in the skeleton, appears formed by the *spine,* the *ribs,* and the *breast-bone:* these together constitute an inclosure which anatomists call the *chest.* But in the living or undissected animal, we have superadded to this, another inclosure, known as the *belly;* which, from the circumstance of its walls being composed of *soft parts*—flesh and skin—leaves no trace of its existence in the skeleton. Let us consider, first,

THE CHEST.

Of this inclosure the spine forms the roof, the ribs its sides, and the breast-bone its floor or bottom: all which parts are more or less excavated or rendered concave in their shape internally, in order that its cavity may be as extensive in every direction as the nature of the fabric will allow. The smooth bodies of the vertebræ are the parts presented to the interior of the chest, from which proceed, on either side, the ribs, describing in their course downward so many elliptical arches abutting upon the breast-bone. The foremost arches are short and straightened; the middle, large and circular; the hindermost ones diminishing in length, and becoming straight again. Altogether, the chest presents in the skeleton

a conical figure: small and contracted in front; broad, deep, and capacious in the middle and posterior regions.

The connexion between the ribs and the bones of the spine is by means of small joints which admit of a limited hinge-like motion between them; but to the breast-bone the ribs are attached by distinct *cartilages*—long pieces of gristle, so formed as to appear like a continuation of the ribs themselves, and virtually, indeed, to answer in some respects a like purpose; for they complete the inclosure inferiorly, and to the contained parts offer, to the extent they reach, as effectual protection as the ribs would give. But they serve purposes bones could not answer. They enable the ribs to enjoy that motion, outwardly, which their joints with the vertebræ intended they should have, for the purposes of respiration; they also enable the ribs to accommodate themselves, by partial turns, twists, and inclinations, to the various movements of the animal: further, by their own elasticity, they endow the ribs with that power of yielding, that high degree of resiliency, which proves the means of their resisting fracture in hundreds of instances where, without the cartilages, fracture must have ensued. The blows, the pressure, the squeezes, the hard rubs, the ribs get, would over and over again break them to shatters were it not for their cartilages. How rarely do we hear of a horse getting his ribs broken, even from the heaviest falls, from the hardest blows, from the greatest weight imposed upon them!—when any shock of this description is given, we hear a sudden burst of air from the chest, occasioning momentary exhaustion; but we rarely indeed find it productive of fracture of the ribs. Far other and fatal must have been the consequences had the entire rib been one solid piece of bone: to say nothing about the difficulty any act of exertion must necessarily have occasioned in the breathing, any violent blow or fall, or great weight jolted upon the back, must have broken the ribs into pieces. On the other hand, had the ribs been composed from end to end of cartilage solely, the form of the arch could not have been sustained; neither could the effects of blows, or superimposed weight have been resisted; but, sooner or later, the arches must have become bent inwards, and so encroached upon the cavity of the chest as to have compressed the organs of respiration and circulation to that degree that could not but have

ended in suffocation and death of the animal. It was only the judicious and well-arranged combination of bone and gristle in the construction of the chest that could answer all the various ends an all-wise Providence had in view.

The chest being the repository for the organs of respiration and circulation—the *lungs* and *heart*—the grand point for the consideration of the horseman, in judging of a horse in respect to it, is, its form or its *capacity*, the one being inferred from the other. It is natural to suppose that the largest lungs and heart inhabit the largest chests, and, *cæteris paribus*, that horses possessing them must also enjoy advantage in wind, as well as such other advantages as are found to accrue from an ample respiration and circulation: upon this, in fact, principally depend his powers of exertion and endurance, as also his constitutional disposition to make and maintain condition. Now, capacity of chest will be derived from breadth, depth, and length of the cavity.

BREADTH OF CHEST is the result of circularity in the arches of the ribs: hence a broad and a circular chest amount to the same thing, or have only this difference, that, the breadth not being always in the part where it ought to be, may be present without or with only a part of the circularity. For example, a horse that has a circular chest will have thick or strong shoulders, and a broad back and breast; but in another, the ribs may curve well out from the spine, giving breadth of back and thick shoulders, but afterwards turn suddenly inward and proceed to the brisket with hardly any further curvature; the result of which is that such a formed chest is defective, not only in depth, but in width likewise, except just at the superior part. When the ribs proceed from the spine to the breast-bone with very little arch or curvature outwards, the animal becomes narrow-chested, or, as it is pertinently expressed, *flat-sided*. In a well-formed chest the arches the ribs form from one abutment to the other are pretty regularly elliptical, and at their inferior ends are lengthened out so as to give as much *depth* to the cavity as is compatible with the general fabric: the curvatures of the ribs are conspicuous behind the elbows, and the rider feels he has, when mounted, a good clutch between his legs. The broad or circular chest being that which affords the most internal space—most room for the operations of the contained organs, out of which

result, wind, and strength, and stamina—it has ever been throughout the animal world considered a point of the greatest desideration. We see it associated with good wind and bodily strength in numerous quadrupeds, in fowls, in man even: we have only to contrast the circular chest of the bull-dog with the narrow one of the greyhound; that of the goose with the turkey's; and one man in this respect with another; and we shall have striking evidence of a fact of which it would be easy to multiply examples *ad infinitum*. It is upon this same principle of conformation that farmers, and graziers, and cattle dealers, proceed in their selection and judgment of stock—not for purposes of wind and strength, so much as for their known constitutional powers to grow fat, their disposition to feed kindly, and to turn out such in the hands of the butcher as others, differently formed, with double and treble the quantity of food, would never become: indeed, form of chest has grown into a consideration of the first importance with the agriculturist, and by him has been turned to a most useful and profitable account. And to the horseman, is it no mean advantage for him to possess a horse with good stamina—strong wind and constitution—one that will do double the work of another, and do that work upon comparatively little or indifferent provender? But, in his case, joined with this consideration, is another, one of equal or more import still, and that is, *action*. Can the horse with the circular chest perform—make use of his limbs—as well as one with a chest differently formed? Can he go as free and as fast? We must answer, No! The breadth of his chest will be disadvantageous to the action of his fore limbs; and, therefore, we must be content to make a sacrifice in one respect that we may be gainers in another. Nature, however, even in this apparent dilemma, has made a provision, by giving

DEPTH TO THE CHEST: a formation which greatly compensates for deficiency in breadth, while it enables the animal to use his fore limbs with all the freedom and effect required. Be sure to look for plenty of *depth in the chest:* it is a most important point, where we cannot have breadth or circularity, and where speed or action is demanded. Nowhere in nature is the design of this or that form of chest more strikingly and beautifully shewn than in the different breeds of horses. The cart-horse is admired

for his "fine round barrel," and his "broad, full, fleshy bosom:" the racer, for his "great depth of chest," without that breadth and consequent seposition of the shoulders, which would diminish his facility of progression. In both cases—as in the bull-dog and greyhound—there is ample girth of chest, and, therefore, space enough for the play of the lungs and heart, though the circular admeasurement is obtained in different ways; the one animal being seldom required to go out of a footpace, the other being intended to trot, to gallop, to race. Observe how awkwardly and clumsily the cart-horse gallops, or even trots; and with what agility the thoroughbred glides along in his canter or speed! Only exchange their chests, however, and mark what would happen! The result is sufficiently shewn in what we see in cart-horses with deep and narrow chests, and in circular-chested race-horses: the one is "all abroad" in his gallop, and cannot go "any pace at all;" the other has not the substance about his shoulders and neck a horse for heavy and laborious draught ought to possess.

LENGTH OF CHEST, in general, is not a desirable point in a horse, because it is commonly combined with shortness of rib, and consequent deficiency in the vertical diameter of the cavity, or else with flat-sidedness and narrowness of the area: where, however, we find the ribs of their requisite length and proper span, and where the interval between the last rib and the hip-bone is but short—which by horse people is called being "ribbed home," or "well ribbed up"—then the length of chest is what all judges in horses will not fail to admire. The space between the last rib and the hip or haunch-bone forms the part denominated *the flank*. When this is lengthy, and the flank in consequence loose or tucked up, the horse is said to be loose or slack in his loins; though, in point of fact, it is the *flank* and not the loin, which is "loose" or "slack:" at the same time be it observed, it is the circumstance of the loin being commonly defective in such formations that has led to the phraseology. Depth, and length, and breadth of chest, with other structures in accordance, will insure enduring speed, with wind and bottom in its possessor. One of the most remarkable instances I ever saw of this perfection of chest was in the famous old mare, *Fleurs-de-Lis*, the property of George the Fourth: she had one of the deepest chests and finest shoulders, perhaps, ever seen; and

for her qualifications and performances I need hardly refer any sporting man of the present day to the Records of Racing.

Before quitting this part of my subject, I would say a word or two concerning what is well understood among horse-men by the phrase "girth" of a horse, i. e. what he measures round in that part of his body usually encircled by the girths. So deceptive is this measure apt to be, that even the best judges are not unfrequently a good deal out in their opinion about the dimensions of horses' chests: I have often myself been surprised to find one horse measuring more than another whom I had regarded as a much larger chested horse. It is, therefore, in all cases, where any doubt arises, a good plan to refer to the rollers or girths, which afford never-failing tests of the true circumferent admeasurement: we may always learn from the groom that such a horse buckles up two or three holes tighter in his roller than such another; or that the girths which fitted the former are altogether too short or too long for the present occupier of his stall.

THE BREAST, as the front part of the chest is called—"the bosom," as it is wrongly and absurdly named by some—is a point worth our attention. It should possess breadth and fulness; the breast-bone should be prominent, and the sides of it well filled in with plumpness; the action of the fore limbs, as we shall see by and by, a good deal depending upon the formation and substance of the breast. When the breast is wide, the fore legs will be far apart, as we see instanced in the cart-horse and bull-dog; and, in consequence of the arches of the ribs being circular and projecting, the elbows are very apt to be turned outwards: a position of limb—to say nothing about its seposition from its fellow—very unfavourable for progression. On the other hand, when the breast is narrow, the fore limbs are approximated—seem, to use a dealer's expression, "as though they both issued out of one hole." This conformation favours speed, but on several accounts is highly objectionable. When the breast is narrow, the chest is so likewise; the animal is flat-sided; and his fore legs are placed so near together that, in action, they are continually striking each other, occasioning sores or bumps upon the fetlocks, speedy-cut, and other annoyances; not to mention the weedy make and want of stamina such a horse will evince. Dealers in cart-horses are very particu-

lar in their search after stock "with good," i. e. full and ample, breasts; they well know the value of such a point, and the dependence to be placed upon it in indicating a good or bad worker. With nags and others we are not in the habit, I should say, of paying sufficient attention to it. Although we may not require—had rather not have—a *broad* chest, yet cannot the breast be too fleshy or prominent. A lean-breasted horse cannot fail of being weak in his fore limbs, if he be not in his hind too. When I speak of a prominent breast, however, I do not mean one that projects so much forward that the fore legs appear to recede from it underneath the body, making the animal what is called "stand over;" for this shews faulty position of the fore limbs, and a sort of unnatural lengthiness about the fore parts of the breast, which cannot but prove disadvantageous in progression. I shall revert to this point when I come to speak of the position of the fore limbs.

THE BELLY.

This being a part which has no existence in the skeleton, would hardly, with propriety, be considered by us in this place, were it not intimately associated in its formation with the chest, and so dependent upon it for its form and size, that we seem called upon to transgress the rule of procedure we had set ourselves at the beginning.

The chest and belly, in inseparable union, constitute the *body*. Exteriorly, we can with difficulty determine where one begins and the other ends; but when we come to dissect the body, we find that, interiorly, their cavities are altogether separate, being divided by a broad and complete partition of fleshy substance. The size or bulk of the belly, for the most part, is regulated by the dimensions and form of the chest; though, in many instances, one is large, while the other is comparatively small. In a horse that is "ribbed up," or "ribbed home," the belly receives so much more support from the posterior ribs than when the interval between the last rib and hip-bone is long, that, with the chest, it appears, under all circumstances, to preserve a sort of indivisible union and never-varying proportion. But such horses as are short-

chested, or long or loose loined, and as are, according to the text we have prefixed, "at the same time great feeders, will soon distend their bellies to such a degree that it will be impossible for their entrails to be contained within their ribs; so they will press down, and form what is called 'a cow's belly.'" Upon such a horse, in consequence of the large circumferent measure posteriorly, and the diminished size of the girth round the brisket, the saddle is frequently riding forwards and the girths becoming loose; the only stay to the saddle being a crouper, or girthing tight enough round the middle of the belly to form a sort of indentation in that part, neither of which expedients is very pleasant to the horse or his rider. Opposed to this kind of formation of body is that in which, from want of length, or rather convexity, in the middle ribs, the circumferent measure decreases all the way from the place of girthing to the flanks: the consequence of which is, that the horse is continually slipping his roller and running through his clothes. It is always a sign of good make when a horse "carries his saddle well;" it shews that his back is properly formed, and that he is not encumbered with "a cow's belly." It also looks well when the roller keeps its place, at least when the circumstance is not solely referrible to size or distention of belly.

A LIGHT-CARCASSED, or *heron-gutted horse,* is commonly weak in constitution and defective in physical powers, and altogether unfit for every purpose where strength and endurance, or hard work, is required. Any extra exertion will take him off his feed; and, in addition, he is very likely to evince a timid, nervous, or fidgetty temper. A horse of this description may answer for the park or promenade, and be, with a rider who is not disconcerted or annoyed by his temper, even a favourite, though for real service or work he is next to valueless. We should, however, take care to make a distinction between a light-carcassed horse whose chest is deep, and so far good, and one that has neither chest nor belly to boast of; but, "without middle piece," appears all legs. The former may be a good feeder, and, should he possess this property, will perhaps, in spite of his lightness of belly, turn out to possess some stamina; the latter never can be worth any thing. Indeed, when there is good depth of chest, as regards speed in galloping—for racing—this greyhound form of body appears advantageous, not only from

the circumstance of the animal having less burthen to carry, but because, with the length and looseness of loin with which it is commonly associated, it adds to the facility and extent of the stride, allowing of the fuller accomplishment of that projection of the hind legs which tells so much in galloping progression. On the other hand, a horse that is wanted not more for speed than endurance, for heavy and hard hunting, or for any purpose of strength or lasting, must not possess this receding carcass and looseness of loin: he must be well ribbed up, and short in his flanks, and let down in his belly; must, to use the dealer's well-known phrases, possess "a good bread-basket," and look "as if he always carried his dinner with him." A horse so made, indeed, can hardly ever appear tucked up: the muscles forming the flanks are too short to contract much, and the ribs are too near the hips to admit of much compression of the bowels. After a long and fatiguing day with hounds, a horse with loose flanks and loins will appear as though he were "cut in two," as the saying goes: whereas, a horse well ribbed up, will hardly, after the same, shew any signs of work. What is understood by the phrase "constitution," under which is comprehended the power of standing work and of "coming again," or performing a great deal in a given time, cannot exist in any horse devoid or defective of middle piece.

LECTURE IV.

THE LEGS.

"The legs of a horse should have a due proportion in their length and strength to the weight and size of the carcass."—*Farrier's Dictionary.*

A SORT of general division may be made of the component pieces of the animal machine into parts supported and parts supporting, or, as having reference to loco-motion, into parts moved and parts moving. The body or trunk, including the appendage of the head and neck, which we have already considered, constitutes one division, while the four limbs, which we are now about to discourse on, make up the other.

As far as steady and stable support be the object, it will readily be admitted that four legs are better than three, and that two by no means could be made to answer the purpose of four, or even three: a three-legged form stands not so firmly as one with four legs; and though one with two legs may be contrived so as to stand alone, yet the slightest force disturbs its centre of gravity, and it falls; so little power of balancing itself is it found to possess. The three-legged table or stool, from its being circular or triangular, will stand as firmly as though it had four supporters; but the square table or oblong form requires four legs, one at each corner or salient angle, or two at either side, to give it the full and firm support of which by the carpenter's art it proves to be susceptible. Six or eight legs would nothing augment the stability or safety of the form, and but little its strength: every projecting part has already its prop of support, and the intermediate parts, unless the form be one of extraordinary length, require none. Thus it is with the animal body. Its oblong formation demanded four supporters, two before and two behind: three would not have given it the stability and power of resistance it at present possesses; and again, to have added two legs more, would have nothing increased the security of the standing posture, and but little the powers of support, while loco-motion must by such an addition necessarily have become more or less complicated and impeded.

It is seldom that the horse, while at rest, employs all his legs in maintaining the standing posture: commonly, one of the hind limbs will be found flexed—in a state of relaxation and repose, propping up the body passively only—while the other three remain extended: in this position, changing the flexed hind-leg from time to time, a horse will not only take his rest, but will sleep; no vigil or attention of the will being required to keep him upon his legs. Some horses never lie down—never appear to require recumbent repose.

Another reason why Nature has given four legs to the quadruped, is, that he may be enabled in progression to steadily poise himself upon three of them, while the fourth is in motion off the ground. Not merely in the walk and trot, but even in the gallop, is the action of the legs, both in leaving and coming to the ground,

alternate; and though two or three, or even all four feet may be in the air at the same instant of time, they never leave the ground nor alight upon it again simultaneously: by such a mode of action the purposes of progression are excellently served on the one hand, while on the other, the machine experiences no such concussion as it would have done had there existed but three legs, or had two of them come to the ground simultaneously, as is the case sometimes in galloping and leaping.

One advantage more accruing from the gift of four over a less number of legs is, that, having two before and two behind, the quadruped is enabled to use either pair as weapons of defence: the horse can rear or kick against his enemy; indeed, the hind legs may be said to be the horse's especial armaments against his foes. Some animals use their fore-legs in the way we do our arms, having claws instead of hoofs, which serve them after the manner of fingers: this they could not do were they not provided with two hind-legs, upon which they have the power of sitting or supporting themselves while their fore-limbs are otherwise employed.

THE POSITION, as well as the number of the limbs of the quadruped, evinces excellent contrivance of design. Not only have the limbs to support the body, but they have to carry it from place to place, and at the same time to move themselves under their burthen with more or less velocity. In a three-legged stool, or in a four-legged form or table, the legs are placed at the circumferent parts or projecting angles, as far apart as possible from each other, the objects being to extend the base or standing, and at the same time avoid the risk of the legs coming at any time, from weight imposed too near the edge, within the centre of gravity, and thereby proving incapable of saving the stool or table from upsetting. In these cases stability and strength is all that is required; but in the instance of the vital machine, not only are strength and stability needed, but facility of motion likewise; and extension of the sphere of the base or standing, which would have better insured the one, would have added difficulties or impediments in the way of the other.

Nature has placed her props of support at the extreme points or salient angles of the animal machine, and longitudinally has

extended the sphere of the base, but laterally has narrowed the body, and approximated the limbs, in order that the superincumbent burthen might as little as possible incommode them in their motions forwards and backwards, during progression.

When speaking of the chest, I observed, that the wider that cavity was made, the farther the two fore limbs must necessarily be thrown apart. This cannot fail to have an effect both on the standing and on the progression of the animal. A broad-chested horse—a cart or dray horse—stands more securely than a narrow-chested horse: his base of standing is wider, his props of support being farther removed from the centre of gravity. But, when the machine comes to be moved, the limbs thus widely separated will not operate with the same effect as others more directly under the centre of gravity—will not carry their load with the same advantage, nor will they act so straight-forwardly or so harmoniously together. The racer and the cart-horse, the greyhound and the bull-dog, and, among bipeds, the turkey and the goose, as I before stated, strikingly illustrate this point of structure in their make and in the gait or action arising out of it: to mark this difference we have but to compare the straight stealing-onward step of the racer with the round and short step of the dray-horse; the steady smooth canter of the greyhound with the rolling gait of the bull-dog; the pointed parade-like walk of the pea-fowl or the turkey with the waddle of the duck or goose. Nay, I might adduce even the human body—the woman with her broad hips, the man with his straight or narrow ones—to shew what a difference in the gait results from the limbs being thrown apart at the axes of their motions.

Length of Limb is likewise to be considered. Short legs are in general preferred, because in themselves they indicate superior strength, and because, by nature, they are associated with depth of chest and carcass, and other signs of stamina and durability; but the long limb possesses advantages in stride and leverage, and therefore, where speed is required, becomes a desirable formation. The length of limb must very much depend on the purpose the animal is destined for: a long leg would be as ill adapted for a cart-horse, or a horse to carry weight, as a short one

would be for a racer. In speaking of the body, I observed that the animal must have length, as well as power, to become fleet: "to get over the ground" *length* becomes absolutely necessary in the propelling parts of the machine, and these are the loins and the limbs. To be sure, we do occasionally meet with horses with long limbs and short bodies—the Persian horses I have seen have been of this description; but such are rare and undesirable conformations; the limbs, as I observed in a former lecture, doing too much for the body, or rather, the latter restricting them in their action. People in general make objection to horses with undue length of limb: such a horse has "too much daylight underneath him to be good for any thing" is a common expression enough in these cases; and, *primâ facie*—and in nine cases, perhaps, out of ten—these people are correct in their disapprobation. But, every now and then comes a horse before us with all this apparent objectionable sub-corporeal "daylight," and yet with extraordinary power in his long limbs, with circularity in his chest though it be not deep, and with the known character of being "a good feeder after work;" and when such a horse does present himself, we may, should he possess breeding, regard him, notwithstanding his long legs and light body, as an animal of a rare and valuable description. His legs having but little to carry, are therefore likely to "wear well;" but what is of the greatest consequence as a hunter or racer, he is likely to prove a fleet horse, and withal a good-winded horse. I have known horses whom, looking at their "herring guts" and long legs, nobody would have purchased, and yet, from their being in possession of the qualities hereinbefore mentioned, that have turned out most valuable acquisitions. I mention these facts to shew that one ought not hastily to reject a horse with long limbs and their ordinary accompaniment, a light carcass.

THE FORE-LEGS.

The two fore-limbs—*extremities,* as they are often called by professional persons—differ essentially from the hind ones in their superstructures; though their lower members and their pedestals are similar one to another. There is no resemblance, for instance,

between the shoulders and the haunches, little between the arms and the thighs; but below the knees and hocks, all the four legs are constituted alike.

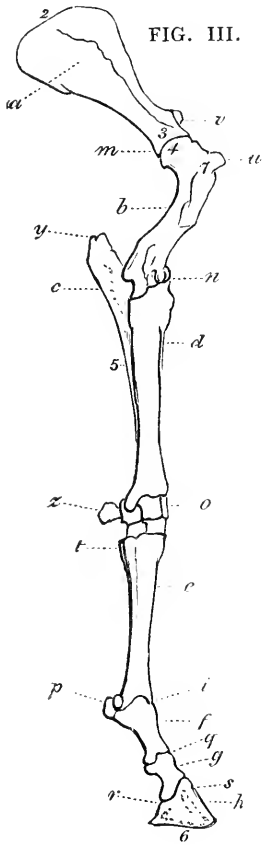


FIG. III.

The divisions of the fore-extremity are, the *shoulder* (*a*, *b*), the *arm* (*c*, *d*), the *cannon* (*e*), the *pastern* (*f*), the *coronet* (*g*), and the *foot* (*h*): the joints are, the *shoulder-joint* (3, 4), the *elbow-joint* (*n*), the *knee* (*o*), the *fetlock* (*p*), the *pastern-joint* (*q*), the *navicular-joint* (*r*), and the *coffin-joint* (*s*). Each fore-limb is composed of twenty-one pieces or separate bones:—two compose the shoulder, the *scapula* or blade-bone (*a*) and the *humerus* (*b*); two, the arm, the *radius* (*d*) and the *ulna* (*c*); eight small bones (*o*, *z*), the knee; three, the leg, the *cannon* (*e*) and two *splint-bones* (*t*); two, the fetlock, the *sesamoid-bones* (*p*); one, the pastern, the *pastern-bone* (*f*); one, the coronet, the *coronet-bone* (*g*); and two, the foot, the *coffin* (*h*) and the *navicular-bone* (*r*). Some of these bones are long, some short; some are cylindroid, some flattened in shape; some are obliquely, others perpendicularly placed: all are connected one to another in such manner as to form sorts of hinges or *joints* between them, from which they derive various kinds and degrees of motion.

Viewing the bones of the fore-limb in their natural position we find that, instead of its component pieces being ranged in perpendicular lines, one upon the other, some of them form angles with each other, while others descend in straight lines, direct from the body towards the ground. The two bones composing the shoulder, for instance, are angularly disposed; the arm and cannon bones constitute straight shafts of support; but the pasterns strike off in an oblique direction, at an obtuse angle, and

thus convey the superincumbent weight to the ground. This peculiarity in the direction given to the different bones we shall find has its uses. One grand object to be accomplished in the formation of the limbs was, to save them from the effects of the concussion which, in sustaining so great a weight as the body in action—occasionally surcharged too with a burthen in addition—must otherwise have fractured their component bones; nay, crushed such as are of a fragile texture into pieces. Another object, in the angular formation of the pasterns, has been, as we shall discover hereafter, to enable them, in a measure, to compensate for all absence of any thing like active foot-hold property in the hoofs of the horse.

THE SHOULDER.

No individual part of the animal frame, in the estimation of horse-people, calls for greater demands on their judgment than this: a good or a bad shoulder is held to be of paramount importance to the animal's riding or going in such a form as is pleasant to his rider, and as tells in action and safety as regards himself. The connoisseur steps up to the horse for sale, in his stall, and by simply carrying his eye over his shoulder and placing his hand upon his withers, determines at once his qualifications, either for saddle or harness, and whether he be such a nag as is likely to suit him for the purposes he requires. Before, however, I attempt to shew by what art this "judge of horses" so summarily and surely arrives at this point of discernment, it will be necessary for us, first, to dissect the shoulder and examine its component parts; and, subsequently, to endeavour to analyze and understand its action in progression.

In the skeleton, the shoulder consists of two bones—the *scapula* and the *humerus*. The scapula or blade-bone—the same that we find in a shoulder of mutton—is the proper shoulder-bone; the only one in man and the monkey-tribe which constitutes the shoulder; the humerus being—as its name indicates—the *arm* bone: in the horse, however, and in other quadrupeds, both bones go to the formation of the part we call the shoulder. In an anatomical point of view, the fore-leg of the quadruped corresponds with

the *arm* of a man or a monkey, hence arise such differences in their structure as we might expect to find from knowing how vastly unlike they are in their economy: the arm of the quadruped, in fact, becomes a leg; the hand, a foot; and the offices of both altogether transposed. A man has it in his power to crawl or walk upon his hands and feet somewhat after the manner of a quadruped; a monkey does so by nature, at the same time that he possesses the power, to a certain degree, of erecting himself and walking upon two legs like a man, and using his fore limbs after the manner of arms: although, however, the monkey makes use of his upper or anterior extremities in this double capacity, neither in progression nor manipulation is he any thing like so perfect as quadrupeds on the one side and man on the other. It is the set-off of the humerus from the body—its connexion with the trunk by the head alone—which, with a somewhat different formation of joint between it and the scapula, enables the bone to perform all the various motions we see the arm of a man capable of: whereas, confined and bound to the sides of the ribs, as we behold it in the quadruped, it is simply susceptible of playing backwards and forwards, or, at least, of very little other kind of motion.

The scapula, being a broad flat bone, presents two large surfaces; an inner one, which is uniform and smooth, and a little excavated in order to adapt it the better to the convexities of the arches of the ribs, against which it is applied; and an outer one, having a longitudinal ridge (*Fig.* III, 2, 3) running upon it, unequally dividing it into two smaller surfaces. Between the scapula and the ribs there is no joint—neither osseous nor ligamentary connexion, but only a fleshy one: muscles alone attach the shoulders to the body; and as the body is supported anteriorly by the fore limbs, it follows that thus much of the weight is borne by muscular action, or, at least, by muscles becomes transmitted to the legs or pillars of support. A man by passing a knife between the scapula and the ribs would easily sever these fleshy attachments, and in this manner let fall the fore part of the trunk, and the head and neck along with it, to the ground. This constitutes the essential difference in their relations with the body between the fore and hind extremities: while the latter are connected to the trunk and support the hind parts of it through the medium of joints, the former hold

the body suspended, as it were, between them through the intervention of muscle.

The scapula is a bone of a triangular shape, having two long sides and one short: the latter, known as its *base*, is *in situ* turned upwards; its opponent angle, obtruncated and corresponding to the apex, being turned downwards. The position of the bone in relation to the body is oblique: its basis lies as far back as against the seventh rib, while its apex is protruding forward enough to be opposed to the first rib*: at least this appears to be the common situation of the bone, it being evident that any increase or decrease of obliquity must alter its relative apposition as regards the ribs. We see horses with oblique shoulders, and with straight or upright shoulders, and we shall find that the scapula varies in its degree of inclination very materially in these two cases; and that this variation constitutes one especial point on which depends the "goodness" or "badness" of the horse's shoulder. Before, however, we can comprehend the advantages and disadvantages of certain positions of the scapula, it will be necessary for us to examine, both in and out of its situation, the other component bone of the shoulder —the *humerus*.

This is one of that class of bones termed *cylindrical;* and cylindroid, though irregularly shaped, it is. It is surmounted by a spherical top, whose surface, the segment of a globe, is smooth and polished, evidently for the purpose of playing, after the manner of a spherical hinge, within a cup-like concavity occupying the place of the apex of the scapula. There are no two bones in the skeleton whose articular connexion is of a nature to admit more varied and extensive motion than exists between the scapula and the humerus. Let a man take a horse's fore-leg in his arms, and he will find that he can not merely bring it forward and carry it backward, but can also, to a considerable extent, make it perform a sort of rotatory motion: and this, the latter especially, he is enabled to effect in consequence of the mobility existing in the joint formed between the ball or head of the humerus and the socket in the lower end of the scapula.

The power of throwing the leg outwards or inwards in action, of turning the toe out or in, of performing those motions in the manege

* Turn back to "The Skeleton," page 7.

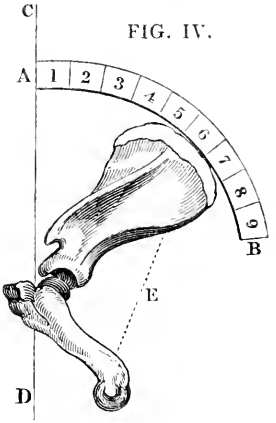
called *passaging* or *shouldering-in*, mostly resides in the rotatory motion possessed by this joint.

Viewing the relative positions of the bones of the fore-limb in the standing posture (*see Fig.* III), we perceive that the two composing the shoulder constitute, *in situ*, an angle of an obtuse character, having two sides; a superior, formed by the scapula; an inferior and shorter one, by the humerus: the point of the angle being turned forwards. This oblique or angular arrangement is attended with several manifest advantages. A larger extent of surface upon the side of the body is occupied and embraced by the bones so disposed, thus affording more extensive and firmer attachment of the limb to the trunk. At the same time that this angular apposition better ensures their connexion with the ribs, it likewise affords the bones facility of motion upon each other, without risk of disseveration or detachment from the sides of the chest; for the movements of the shoulders, which in action are considerable, have to be carried on, not only while the foot is off the ground, but at a time when all the weight of the body is imposed upon them. Another advantage of the angle is the extensive bordering and powerful leverage offered for the attachment and operation of muscle. Had the bones of the shoulder been placed upright or perpendicularly, one upon the other, in the first place, they could not have been made any thing like their present length; in the second, their connexion with the body would not have been equally secure; and, in the third place, their movements upon each other must have been comparatively restricted, giving rise to something in the form of action in the fore-limbs a great deal worse than that paddling sort of going which we denominate "pinned in the shoulders." This will appear more intelligible after we have shewn what is the nature of the motions or action of the shoulders.

The muscles attaching the scapulæ to the sides of the chest impart to the shoulders that strength which enables them to support the fore parts of the animal machine, and move under their burthen with a facility that no joint or other contrivance could have afforded them. The scapula or blade-bone, in the position we behold it while the horse is standing, possesses—in relation to an imaginary line let fall perpendicularly from the withers (see *Fig.* IV, C D)—a degree of inclination or obliquity which varies

more or less almost in every individual: one horse is said to have shoulders *oblique*, another to have them *straight*, depending on the more or less inclined position of the blade-bones; and the former is valued as a riding-horse, and justly so, while the other is condemned and rejected. The reason of this will appear evident when we come to learn that every time the shoulder is put in motion the scapula makes a sort of partial revolution on its own centre or axis, which at first slightly depresses, but instantly afterwards elevates and advances its base or upper part, while its lower part or obtruncated apex, which was at the commencement of the movement advanced, recedes until the scapula has nearly or quite revolved into a straight or upright position. The more oblique the original position of the scapula the greater will be its revolving sweep, and the more free and extensive the action of the shoulder, as will appear evident from the following diagram:—

FIG. IV.



Taking the graduated quadrant A B to represent the arc the scapula describes in its imperfect revolution, it is manifest that, setting the limit of its motion forward at the figure 1, its sphere of revolution will be increased in proportion as its inclination or obliquity is greater at the commencement: a scapula whose base inclines to number 7 in the scale will have two degrees of extent of action more than one which only reaches number 5, and two less than one whose base descends so low as the 9th degree.

The first movements of the shoulder-bones, those that lift the limb off the ground and advance it, consist in a limited revolution

of the scapula, in which its base turns backward and downward, its apex forward and upward, and in a simultaneous flexion and elevation of the humerus, the effect of which is to diminish the distance (represented in *Fig.* IV by the dotted line E) between it and the scapula. The projection of the limb in front of the body is effected by an extension of the humerus on the scapula, and, in rapid or forced movements, by an advance (not a revolution) of the scapula as well: but the instant the foot is grounded and becomes a fixed point and fulcrum, the scapula commences a counter-revolution, its base moving forward and upward, its apex backward and downward, and the humerus returns to its original semi-flexed position. Whether the limb moves upon the body, the foot being off the ground, or the body moves upon the limb, the foot being on the ground, in either case the scapula is in motion, its revolution, in regard to its summit, being backward and downward in one case, forward and upward in the other.

The length, as well as the obliquity, of the scapula will have an influence on the action of the shoulder, it being manifest that a body revolving upon its own centre must describe arcs or sweeps great in proportion to its length; hence the value of a deep shoulder: though, as regards the scapula itself, the muscles attached to and moving it will necessarily be short in a case where the bone is disproportionately long, and *vice versâ*. When the scapula is placed nearly upright, or is of disproportionate shortness, there cannot be that extent or freedom of action in the shoulders; neither can there be that projecture of the limb that there is in opposite conformations. The movements of the fore limbs are likely to be confined or imperfectly effected, and where those of the hind limbs happen to be "good," or of a more perfect kind—as is not infrequently the case—there will be great danger of the horse being, by the comparatively superior action in the agents of progression, precipitated forwards.

A good shoulder not only possesses depth and obliquity, but, to complete its perfection, "lie well into the body." How often do we discover upon the superficies of the shoulder a rising a little below and behind the withers, marking the situation of the summit or base of the scapula. In the generality of instances this arises from the ribs being arched in that part, which precludes the

possibility of the scapula being properly accommodated to them: a flattened body applied against one that is convex must necessarily project as the latter recedes from it; and the only way in which this can be obviated is, either to diminish or alter the convexity, or to give to the straight body a concave form; both of which accommodations are seen exemplified in what we call "good-shouldered horses." The rising is caused by the top of the scapula standing out from the convexity of the ribs: where this is not the case, the surface appears and feels uniformly level, and, where muscles or fat abound, is so smooth that we in vain seek the traces of the scapula through the skin. The uprightness and the length of the scapula likewise, in some instances, operate in producing the rising. In any case, the unevenness betrays mal-proportion or mal-apposition of parts: in other words, would not be present if all had been formed and fitted to perfection.

A shoulder, then, that possesses depth, obliquity, and uniformity, is said to be "good;" and for the purposes of those springy actions and paces which are most agreeable to and admired by the rider, good it most unquestionably is: it is good for action, good for speed, good for spring, and as a point of beauty is veritably indispensable. Still, though this be confessedly the prototype, we are not to set all other kinds and descriptions of shoulders down as faulty and objectionable. For the carriage of heavy burthen, and for heavy draught, I believe a straight or upright and rather short shoulder, provided it possesses the necessary substance or muscularity, to be advantageous: laborious draught does not admit either of a horse taking long steps or of going at any but a slow pace; and on abstract mechanical principles, a horse whose shoulder is short and upright is capable of supporting more weight upon his fore limbs than another in whom it is lengthy and oblique: the sharper the angle formed between the scapula and the humerus, and again between the humerus and radius, the weaker, as props of support, must the fore limbs be considered. A horse, therefore, with a short upright shoulder is, *cæteris paribus*, actually stronger in his fore parts than one possessing what we might call a good or handsome shoulder. Here, in fact, as in many other instances that might be mentioned, we have on the one side, *action*,—and with it spring—on the other, *strength*; and,

as I said before, for cart or dray horses, where heavy draught is required, or for animals wanted to carry heavy loads, the short and upright shoulder is to be preferred to the lengthy and oblique structure.

The connoisseur is quite correct in his observation—"Such a horse cannot ride, *short* and *straight*—for the two properties are commonly associated—as his shoulders are:" but let him not on this account reject the animal as useless: it is, as I said before, the sort of shoulder for harness, and for supporting weight, providing it possesses the required muscularity, and providing the horse has action with it: for, be it observed here, though action may be regarded as the natural product of an oblique shoulder, yet are there many instances where it is found to result from opposite conformations, as well as instances of its absence where one would from appearances prognosticate it to be present. This discrepancy between form and action it is that is so often baffling our judgment and furnishing us with physiological problems which, on too many occasions, we find ourselves unable to solve: nevertheless, the subject, intricate and difficult as it is, shall receive some attention when I come to speak of "action."

Let the action of the horse be what it may, however, should the shoulders be upright we may be certain of the loss of spring in his movements being such as to make him any thing but easy or accommodating in his paces to his rider: he is complained of as being "a rough trotter"—"a bone-setter;" and the higher his action happens to be, the greater will be the concussion. Mr. Youatt has compared the spring produced by the play of the scapula upon the humerus to the spring of a carriage; and in its operation it is a happy illustration of this piece of animal mechanism: the only difference being that in the coach-spring the elasticity resides in the steel of which the spring is manufactured; whereas the bones derive their spring from the elasticity of the material—ligament—by which they are connected together, and of that—muscle—by which they are united to the body.

We have been considering the *depth* of the shoulder and the *position* of the bones composing it, and in the course of our inquiries have noticed its *substance* or *muscularity:* we will now explain what we mean by

THICKNESS AND THINNESS OF SHOULDER, and investigate the relative advantages and disadvantages of these counter-formations. A notion very prevalent among horse-people is, that the shoulder cannot be too thin or "fine," as they call it; and that a thick or "loaded" shoulder is only fit for harness. In these remarks truth is mingled with error, and it shall be our business to endeavour to distinguish and separate them. To set about our investigation systematically, let us first inquire what constitutes this *thickness* or *thinness;*—to what kinds of conformation the terms are applicable, or what they are commonly used to denote. A person grasps the withers of a horse with his hand, and at once pronounces his shoulders "thick" or "thin:" *thin* or *fine,* should the withers stand high and can be included between his fingers and thumb; *thick,* should the withers appear buried between the shoulders, or be so broad across that the span of the hand can with difficulty grasp them: in the former case, we grasp nothing but the spinous processes of the dorsal vertebræ; in the latter, we appear to include the scapulæ as well; hence the thinness in one instance, the thickness in the other. There exists in such horses either inordinate length or shortness of spinous processes, inordinate length or shortness of scapula, or an unusual height or lowness of one or both of them, *in situ,* owing to their position. "The razor-back," as it is called, is the most remarkable instance of inordinately long spinous processes, and this is commonly combined with obliquity, and consequent lowness of the base of the scapula: altogether, presenting an example of "a *fine* shoulder;" though of one that often proves on examination to be strangely deficient in substance. These razor-backs and fine shoulders are frequently seen in very old horses: indeed, it is a common observation, that "shoulders grow fine with age;" the interpretation of which appears to be, that the shoulders participate in that general process of absorption which is known to pervade the animal frame during the decline of life. In young horses, at the growing time of life, the shoulders are thick by nature, and do not, until the adult period is completed, attain that degree of thinness or fineness which they in after-life are found to possess; coupled with which fact, and in corroboration of it, stands the observation so current among breeders and dealers, that their colts are certain to "rise" and "fine" in their

shoulders; and which is now, by all purchasers of young horses conversant in such matters, received as a general law of Nature, to which exceptions are comparatively rare. In my next lecture I hope to be able to shew, in a statistical manner, to what extent, and at what age, such growth may be expected to take place: in the mean time I would observe, in reference to it, that it appears to consist mainly or entirely in a shooting-up of the spinous processes of the vertebræ. We see the colt with thick clumsy shoulders in consequence of his scapulæ reaching as high as the tops of his spinous processes: we examine him grown to a horse, and find him with finely-formed shoulders—with scapulæ no higher than they ought to be, and with withers admirably raised; and, withal, we discover on admeasurement that he has actually risen one or two inches in the withers after, to a common observer, he might have been supposed to have attained his perfect growth.

LECTURE V.

THE SHOULDER (*continued*).

ALL "judges of horses" concur in the necessity, for the purposes of *riding*, for depth and obliquity of shoulder: if there be any discrepancy in opinion among such persons, it consists in one preferring a *strong*, another a *fine* shoulder. Even this, however, can hardly be said to amount to any division of judgment; for the thin shoulder will not, with "true judges," gain admiration unless it possess depth and strength; nor will the thick one be altogether approved unless it *rise* at the withers; in a word, we shall find what is considered by judges on both sides to constitute perfection of shoulder, to reside in a happy combination of depth and obliquity with strength and fineness; and if we desire any confirmation of this, we have only to make our observations on horses known to ride and go as horses ought to perform—on celebrated hunters, horses in Leicestershire and in all our capital studs, who in form are, nowadays, bred as near to perfection as, probably, it is possible for art to attain. I say "bred," because perfection of shoulder, like all animal formation, has manifestly been greatly promoted by attention to breeding.

In a racer—although there are race-horses enow in whom this formation exists and operates in its greatest beauty and perfection—the shoulder is not to be considered so much as the hind quarters and loins. Daily observation shews us, that the shoulder may be any thing but perfect in formation, and yet possess a good deal of action—that, as I said before, we are not advanced to that knowledge of shoulders which will enable us to pronounce on a horse's action by bare inspection of them: we cannot positively say his action will turn out very bad, or must prove very good; we pretend to know nothing *for certain* until the horse is put into action, and then, possibly, we may discover reasons why his action proves so much better or so much worse than we had anticipated. Many excellent racers have what we should call any thing but perfect shoulders; their good qualities are amply accounted for in their round fleshy loins and lengthy muscular hind quarters: on the contrary, many, I repeat, possess as handsome and well-formed shoulders as can be desired; and when this occurs along with the requisite strength and length in the hind parts, surely it must be regarded as a great advantage, providing the action be fitting and commensurate.

BUT FOR HARNESS, or even for support of burthen, as I observed in my last Lecture, the thick or heavy or loaded shoulder is to be preferred to the one that is thin, or that is oblique: a horse so formed is, *cæteris paribus*, actually stronger in his shoulders, capable of carrying and drawing heavier loads; in a word, better formed for these duties. It is not compatible with animal power to exert great strength in draught or carriage, and at the same time step out much in action: the short step husbands the strength, the long one expends it beyond the power of the animal to repeat the act many times or for any continuance with the same effect. It is no answer to this to say, we see horses with excellent action drawing very heavy carriages and still displaying their action in draught. Some horses, it is apparent enough, are in possession of such strength even in action that, what would ordinarily be considered, a heavy load does not oppress them: still, as a general rule, I have no fear in asserting, that both heavy carriage and heavy draught at first cramps or limits, and ultimately tends to habitually diminish action: the horse finds, with the enormous weight behind or upon him, that he cannot, as he could before, step out in action; he perceives, if he does, that he soon exhausts

his strength, cannot make way with his load, and therefore, compulsorily, shortens, and at the same time quickens, his step, not bending and rounding his legs in action as he did when out of harness, or when his draught or burthen proved but light. I well remember a little strong mare I used to drive in my four-wheel chaise, who stepped out remarkably well and even went with great freedom upon a level road; but who, the moment she came to any ascent or hill or bad piece of road, where she perceived the draught heavy, would shorten her step and go pottering along as though she had all at once fallen lame in her feet. In respect to the uprightness or straightness of what we may now call "harness shoulders," there seems to be some connexion between their formation and the common remark in the mouths of coachmen, "the collar cannot set too upright" in position: the straight shoulder affords good reason for such advice, for the scapula and collar will lie nearer in the same line, act therefore more harmoniously together, and the horse, in consequence, will be likely to work not only more agreeably to himself but with greater effect. If this be the proper view to take of draught, so far as the harness-collar and the scapula are concerned, the exposition may prove the means of throwing some light on the "setting" of the former: the remark of the coachman is founded on experience; he knows well that, in general, the collar cannot "set too upright," because—a circumstance perhaps he does not heed—his horses are in general of that description that have thick straight shoulders: when, however, the shoulders happen to be oppositely formed—such as are better adapted for riding than for drawing—we submit, the coachman's remark must fall to the ground, it being advisable, in such a case, that the set of the collar should be oblique—correspond, in fact, with the inclination of the scapula.

"A FINE SHOULDER" is a phrase among horse-people too often apt to be misapplied. Because a horse happens to have very great depth and obliquity in his shoulders, with high tapering withers, he is often said to possess fine or perfect shoulders, when, in reality, he probably lacks in them the very property of more consequence than any other we have been considering, and that is, *muscularity*. His shoulders are oblique and deep, and thin at the withers; but so bony are they, so deficient of flesh or muscle, that the blade-bone appears as if it had no covering save the skin,

through which its outlines are sufficiently apparent to render the horse a most desirable subject for any student of the anatomy of the bone to make observations upon. Muscle-less, and consequently weak as such shoulders are, horses having them often are endowed with brilliant action, and, for riding, turn out most agreeable; to carry or draw weight however, or as hunters—or even as racers, except for light weights and short distances—these horses never can turn out of any value: unless they happen to have—which is very seldom the case—extraordinary powers in their arms and hind quarters, and width in the chest. But when the reverse of this accompanies the thin or fleshless shoulder, however deep it may be, however oblique, however fine upon the withers, for all purposes where stability, strength, and endurance are required, it is absolutely inefficient.

In the department of this important subject—the shoulder—I will endeavour to redeem a promise I made at the conclusion of the last lecture, viz. to shew that horses, after they have to the common observer appeared to have completed their growth, do actually "rise" or grow in their withers, even, in some scarce instances, after the expiration of their seventh year.

So extremely variable and uncertain is found to be the growth of animals, that it is with a full sense of the fallibility of our predictions that we, at any period of their lives, offer opinions about the height they are likely to attain. I have heard a gentleman very conversant and observant in these matters say, it is best not, in purchasing horses, to make too sure of their growing after the third year of their age; and where colts at this age have the appearance of being proportioned, and, as the phrase goes, "set," this is a practical hint which I hold to be well worthy of remembrance: as a general observation, however, it by no means applies.* In our table, 17 three-year-olds out of 144 appear not to have grown in height, making a ratio of twelve per cent. Our faculty of forming tolerably correct opinions concerning future growth will mainly depend upon our opportunities of observation and the accuracy with which we may make deductions. Growing young horses, like growing boys and girls, are, as the phrase goes, "all legs and

* These remarks are meant to apply to *general appearances;* and not to have any reference to actual admeasurement.

wings." An old saying is in vogue, that the future tallness of the colt may be foretold by measuring the distance from the elbow to the fetlock, and carrying the same measurement upwards from the elbow upon the withers: both distances will be equal at the completion of growth; whatever, therefore, is, at the time of admeasurement, wanting in the upper line will have to be made up by growth, or, in other words, will constitute what the animal has yet to rise in the withers. A good deal of faith is put in this presumed attainment of certain proportions; and, for my own part, I can say I now attach sufficient credit to it to put the comparative measurement into experimental practice.* According to the table—compiled from the scanty, though not, I believe, faulty records I have at hand—there is not more than one horse out of eight or nine that does not continue his growth after the third or even the fourth year of his age; whereas, after the second year, the proportion diminishes to one in seventeen or eighteen; and, at the fifth year, increases to one in five or six. There are seven instances registered of horses growing after six years old; and one after the seventh year of age.

One instance stands recorded in the table of a two-year-old colt having made the extraordinary rise of 7½ inches by the time he had completed his growth. He measured 15 hands 3½ inches as a two-year-old, and at the adult period, seven or eight years of age, had attained the enormous height of 17 hands 3 inches. He was a long-legged, ill-proportioned animal, with high spirit and very good carriage of himself, and for this latter reason proved a pleasant horse to ride, though by no means a strong one. In regard to the quantum of growth likely to be made after the respective ages of 2, 3, and 4, on the average, one inch appears by the table to have been acquired after the second year, ⅓d of an inch after the third year, and ¼d after the fourth year.

I submit these computations with considerable diffidence, on account of the limitedness of the records from which I have—in the absence of more—been forced to take them. In its present imperfect state the table may serve as some sort of guide for rough calculations, and to direct us in future inquiries.

* I am about entering on some experimental observations, through which I hope to throw some light on this interesting point.

A TABLE,

Shewing the relative Growths 255 Horses have made at 2, 3, 4, 5, 6, and 7 Years of Age.

Number of Horses 2 Years Old.	Increase of Growth.	Number of Horses 3 Years Old.	Increase of Growth.	Number of Horses 4 Years Old.	Increase of Growth.	Number of Horses 5 Years Old.	Increase of Growth.
	INCHES.		INCHES.		INCHES.		INCHES.
1	8½	1	5¾	2	3	2	2
1	5	2	4¼	1	2¾	1	1¾
1	4	1	4	4	2½	1	1¼
3	3¼	3	3¾	3	2¼	2	1
1	3	1	3½	2	2	3	½
1	2¾	5	3	1	1¾	2	None.
2	2½	4	2¾	5	1½	11	6½
3	2	5	2½	3	1¼		
2	1¾	3	2¼	8	1	Number of Horses 6 Years Old.	Increase of Growth.
3	1½	7	2	3	¾		
6	1	8	1¾	13	½		INCHES.
3	¾	10	1½	6	¼	1	2½
2	½	11	1¼	7	None.	3	1
4	¼	27	1	—	—	1	¾
2	None.	11	¾	—	—	2	½
—	—	17	½	—	—		
—	—	11	¼	—	—	7	4¾
—	—	17	None.	—	—		
—	—	—	—	—	—	Number of Horses 7 Years Old.	Increase of Growth.
—	—	—	—	—	—		
—	—	—	—	—	—		INCH.
35	36¾	144	40¾	48	19½	1	¾

We must not think of quitting this subject until we have profitted by the brilliant lights that have been incidentally cast upon it by one of the greatest physiologists and discoverers of the age in which we live,—the late Sir Charles Bell. Every one is acquainted with those interesting and beautiful productions, "The Bridgewater Treatises," among which, as one link in the series, stands the work from which we are about to make extracts that will confer pre-eminent richness upon our present field of investigation.

After observing that, in the horse and other quadrupeds, with few exceptions, the connexion between the extremity and the

trunk is solely through muscles; and that in the horse, as in most quadrupeds, the speed results from the strength of the loins and hinder extremities, Sir Charles continues, "Were the anterior extremities joined to the trunk firmly, and by bone, they could not withstand the shock from the descent of the whole weight thrown forwards; even though they were as powerful as the posterior extremities, they would suffer fracture or dislocation. We cannot but admire, therefore, the provision in all quadrupeds whose speed is great, and whose spring is extensive, that, from the relative position of their bones, they have an elastic resistance, by which the shock of descending is diminished."

"If we observe the bones of the anterior extremities of the horse, we shall see that the scapula is oblique to the chest; the humerus oblique to the scapula; and the bones of the fore-arm, (called by us the *arm*) at an angle with the humerus. Were these bones connected together in a straight line, end to end, the shock of alighting would be conveyed through a solid column, and the bones of the foot or the joints would suffer from the concussion. When the rider is thrown forwards on his hands, and more certainly when he is pitched on his shoulder, the collar-bone is broken, because, in man, the bone forms a link of connexion between the shoulder and the trunk, so as to receive the whole shock; and the same would happen in the horse, the stag, and all quadrupeds of great strength and swiftness, were not the scapula sustained by muscles, and not by bone, and did not the bones recoil and fold up."—"Much of the strength, if not the freedom and rapidity of motion, of a limb, will depend on the angle at which the bones lie to each other; for this mainly affects the insertion, and, consequently, the power of the muscles. We know, and every moment feel, that when the arm is extended we possess little power in bending it; but as we bend it the power is increased, which is owing to the change in the direction of the force acting upon the bone, or, in other words, because the tendon becomes more perpendicular to the lever."

We have already shewn that the scapula possesses a rotatory sort of motion upon the ribs, and that the sphere of its motion becomes increased by its degree of obliquity. Sir C. Bell has explained the cause of this—"the serratus muscle"—the fleshy at-

tachment of the scapula to the trunk, and the means through which the latter is suspended—"when the scapula is oblique, has more power in rolling it." Other muscular advantages likewise accrue. "When the scapula lies at right angles with the humerus, the muscles which are attached to the latter act with more effect. And on the same principle, by the oblique position of the humerus, and, consequently, its obliquity in reference to the radius and ulna, the power of the muscle inserted into the olecranon is increased. On the whole, both power and elasticity are gained by this position of the superior bones of the fore leg. It gives to the animal that springs a larger stretch in throwing himself forward, and security in a soft descent of its weight."

Sir Charles has admirably illustrated by sketches contrasting the fore extremity of the skeleton of the elephant with that of the camel, that the former is evidently constructed for strength, the latter for spring and speed: pillars of bones, like stone columns, standing in upright positions are evidently intended to support weight, movement being a secondary consideration; on the other hand, bones arranged in regard to each other in zigzag or oblique directions, are adapted for movement and spring, ability to carry weight being the secondary consideration. This point has been already illustrated by comparisons between the upright shoulders of dray-horses, and the oblique ones of thorough-breds.

Let us now pass to

THE ARM.

Anatomists and horsemen will find themselves at variance concerning the part to which this appellation is applied. The anatomist regards the *humerus* as the bone of the arm: the horseman calls that part "*the arm*" which extends from the elbow to the knee; and incongruous and, to the anatomist, confusing as these appellations, *arm* and *knee*, are, yet has custom so established their use among horse people that we dare not refuse to adopt them. The horseman's "arm", consequently, becomes the anatomist's "*fore-arm*": the *humerus* or proper arm being incorporated with the shoulder, from the circumstance of the horse not being provided, as a man, and a monkey, and some other beasts are, with those

little bones whose use is to set the arms off from the shoulders—the *clavicles* or collar-bones.

The arm of the horse, the same as our own fore-arm—to which, I repeat, it corresponds—has in its composition two bones, the *radius* and the *ulna;* but with this difference, that in man and the monkey, and also in some quadrupeds, the ulna is a separate bone of equal length with the radius; whereas in the horse it is nothing more than an attachment to the radius, the medium of union between them being in the young animal, and indeed up to the adult period, an elastic (cartilago-ligamentous) substance, which yields to force, and thus in action serves the purpose of a spring, diminishing concussion. Indeed, this appears to have been one reason why the ulna was not extended to the knee-joint: had it been a separate bone no such spring could have existed. At full growth, however, or very soon after, the uniting elastic matter becomes converted into bone, consolidating the ulna with the radius, and for ever destroying the original spring.

At the superior part the ulna enters into the composition of the elbow-joint, the same being the part which protuberates backward and forms the elbow. Thus placed and fashioned, the ulna answers two important uses: one is, extension of the surface of the joint and limit to its motion backward, by serving as a stop to it; the other is the leverage it offers for the insertion of muscles whose office is to extend the fore-limb. The advantages derived from long and prominent elbows are precisely such as are afforded by length of lever in any situation out of the body: providing the weight to be lifted and the lifting forces to remain the same, the power of the latter will be increased in direct ratio with the length of the lever—the elbow; and considering that the operation of these muscles though immediately upon the arm, extends all the way to the foot, a long lever may make a difference of some pounds even in the capabilities of the fore-limb. So far as progression is assisted by the fore extremities, it is by the action of the powerful muscles inserted into the elbows: while the flexors of the arm have only to lift the limb off the ground and advance it, the extensor muscles—attached to the elbow—have, the moment the foot is grounded, to aid in the grand operation of progression. We see, then, the necessity for long and prominent elbows. Some horses appear

as if they had no elbows: the protuberances are either so short or stand so in or upright, that they are not perceptible to the eye, and can hardly be felt; which I look upon, myself, as a great deficiency, though it is one that, even by "judges," is not at all times noticed. People invariably pay great attention to hocks, but seem to overlook elbows; as I said before, however, for my own part, I do think that length and form of elbow is a point of considerable importance, and as such, I never lose sight of it.

At mature age, the arm of the horse is composed of a single bone—the *radius:* the ulna being, in truth, but a process. And the radius is a bone of superior strength, its great length, with the weight and shocks, and muscular action it has to sustain, requiring that it should be so. Two smaller bones of the same length would have been too liable to fracture. Entering into the structure of the fore limb are two long straight shafts of support: the radius constitutes the uppermost of these, the cannon or leg bone the undermost; all the other supporters being angularly disposed.

The radius in itself, however, is not a mathematically straight bone: between one extremity and the other it is slightly curved, after the manner of a bow, the convexity of which is presented forwards; so that were it placed upon a table or any level surface, with its hinder part turned downward, it would form a very extended arc; and this shape it is which renders it remarkable beyond any other bone in the horse. Thus fashioned, as a column of support it is capable of sustaining greater weight, or at all events greater shocks, from a property, which as a sort of bow it must possess, of elasticity. What are called "calf-legs" do not arise from any deficiency of this bow of the radius, but from peculiar position of the knee-joints.

Superiorly, the radius is connected with the humerus, the nature of the joint formed between them being such as admits of flexion forwards and again of extension, but neither of flexion backwards nor of any lateral motion. A horse has the power of advancing his arm, and raising it rather beyond the line of right angle with his body; but he cannot bend it in a backward direction: the limb is extended backward through the motion of the humerus on the scapula. Had the elbow-joint moved backward as well as forward, the animal must have been so insecure upon his legs, that

constantly while in action, and even while standing still, he must have been in danger of falling, from his legs "slipping under him:" for the standing posture is only surely maintained by the continued action of the muscles implanted into the elbow.

Having considered the arm in relation to the connexion subsisting between the shoulder and it, to the leverage it offers by the projection of the elbow, and to its form and substance, let us now view it in reference to its length, and to the position it has in respect to the body, and afterwards proceed to the examination of the knee and leg.

A LONG ARM is held to be a point of excellence: it is one of the characteristics of speed; the deer, the greyhound, the fox, the rabbit and hare, have all of them long arms. It also denotes strength. A long arm includes the supposition of a short leg or cannon; and shortness in a bone which simply acts as a prop of support, is a sign of strength; hence the lower we descend in the limb, the shorter we find the bones: thus, the cannon is shorter than the arm; the pastern than the cannon; the coronet than the pastern; the objects being strength, and, as much as possible, the mitigation of concussion. The arm, it is true, likewise constitutes a shaft of support; but, then, it is on every side surrounded by muscle, from which it must receive considerable sustainment: whereas, the bones below the knee are without any active or vital embrace; are, in fact, left without any support and protection, save what little they derive from tendon and ligament. Again, the arm being the moving power, the leg, the part to be moved, length and substance in the former contrast advantageously with shortness and compactness in the latter: every inch added to the leg increases the weight of the shaft to be raised and projected, and calls for additional power in the propelling agent. And again, length of arm will give the horse advantage in action: every step he takes in a walk or trot, will, from the greater reach of the arm forwards, prove so much gained to him; and these gains, though insignificant of themselves, may in the course of a mile turn out something considerable.

Should the arm be short, though it be muscular and strong, yet will its power tell to comparatively less effect when the cannons are long, and from that circumstance alone proportionably weak: horses so made are absolutely weaker—less stable—upon their fore

legs than others: they do not possess the same power of recovering a false step, and are consequently more likely to fall and break their knees; neither do such legs "wear" well, but by hard work soon evince instability and tremor at the knee-joints, with knuckling-over of the fetlocks. On all accounts, therefore, a long arm with a short cannon is to be preferred.

THE POSITION OF THE FORE LIMBS, in respect to the trunk, in which I include their line of descent from the body to the ground, will mainly depend upon the length of the humerus, and the direction given to the radius by its articulation with it. In animals in which the humerus, forming part of the shoulder, is placed in an oblique position, it is, as is observed by Sir Chas. Bell, "necessarily short; otherwise it would throw the leg too far back, and make the head and neck project." "It is," continues Sir Charles, "one of the 'points' of a horse to have the humerus short. And not only have all animals of speed this character, but birds of long flight, as the swallow, have short humeri." In horses in whom the points of the shoulder appear to project inordinately forward, the fore limbs will be found to be placed farther backward than usual, owing to the too great length or obliquity of the humerus; and should the limbs at the same time, from the nature of their connexion with the humerus, have an inclination in their line of descent backward, such a horse, from his liability to fall and the little chance he has of recovering any stumble or mis-step, is to be regarded as dangerous in the extreme: in fact, he is fit but for harness, and never ought to carry a saddle. The centre of gravity being thrown so much more forward than it ought to be, with the undue preponderance given to the head and neck, will cause the weight of his body to be thrown, by the impetus of action, almost all into his harness-collar, and thus prove of material assistance to him in his draught. In a horse with well-formed and straight fore limbs, a plumb-line let fall from the point of the shoulder will drop touching the point of the toe; but in a horse formed after the manner described above, the line will fall in front of the toe of the hoof.

The Knee.

The knee of the quadruped is the part which corresponds, anatomically regarded, with the *carpus* or wrist of man: differently circumstanced, and differently used as the two parts are, yet is there considerable analogy between them in structure. Each of them is composed of eight bones, though in the knee only six out of the number are placed so as to sustain pressure; the remaining two being situated behind the others, out of the line of the superincumbent weight. One of these supplementary bones—called, from its shape, *trapezium*—is affixed edgeways to the outer part of the back of the knee-joint, and there answers the most important purpose of furnishing a lever for those muscles whose office it is to flex the leg: both celerity and force were required in this flexion or catching-up of the leg off the ground in action; and these are attained through the advantages the muscles derive in their action from the projection of the trapezium. When we see, therefore, great breadth of the outer side of the knee, and that its hinder part is very prominent, throwing the muscles attached to the point back and so increasing the breadth of the arm, we may pronounce such a horse to possess great power in flexing his legs, and commensurate strength and quickness in action.

There are six small bones, then, sorts of irregular or mis-shapen cubes, placed between the two main straight shafts of support of the fore limb, viz. the radius above, the cannon-bone below. Upon the summit of the latter the three lower of these bones, ranged in one row, rest; while upon the three constituting the upper row presses the lower end of the radius. Why was the knee-joint constituted in this manner? Why were these bones interposed? Why was not the end of the radius connected by joint at once with the end of the cannon-bone? Because Nature had more objects to fulfil than could have been accomplished by any simple or single formation of joint. By a joint between the radius and cannon-bone the weight would have been quite as well sustained as it is at present; but the concussion must have been greater: nay, the motion might have been as great even as it is now between these two bones; but then, at the time that the leg was flexed on the arm to the utmost, how would the knee-joint in front have become

exposed, and what must have been the consequences of a broken knee? or how could the animal with impunity have gone down upon his knees, in the act of lying down or kneeling, as he can at present? Suppose a sort of *patella* or knee-pan had been placed and attached in front of the knee, would that have answered the purpose? Perhaps, as far as standing and motion are concerned, it would; and, perhaps, some such contrivances as exist in the knee-joint of a man—the *semilunar cartilages*—might have been successfully introduced for warding off concussion: still, the chances both of fracture and dislocation must have been great, whereas now, such accidents never happen*; and besides, the knees so formed never could have undergone "the wear and tear" with the impunity they are, such as they are, enabled to do.

Nothing can exceed the complete aptitude of the joint of the knee for every purpose named and required of it. Though there are six bones actually entering into its composition, yet so braced and bound together are they, by ligaments, in their relative situations, that, while they admit of every requisite motion in the joint, they support the superincumbent weight with all the stability of a solid structure, and are secured both against fracture and dislocation under any use or abuse to which the knee may be subjected. Moreover, the joint receives protection both in front and back by the tendons which pass across it, and has, in addition, a general enclosure of capsular ligament.

Large knees constitute a good point in a horse; they denote strength and stability; in action, safety and endurance; and, as I observed before, it is a great point to have a boldly projecting trapezium. The motion of the knee-joint consists in flexion backwards —none whatever in the forward direction; and this flexion backwards is capable of being carried to the utmost extent—so far as to bring the back of the leg in contact with the back of the arm. Nothing illustrates this better than the strapping of the leg and arm together; an expedient not infrequently had recourse to when

* Many years ago, when I was quartered at Chatham, and in the habit of hunting with the Wouldham harriers, a person assured me he "put out his horse's knee-joint" in galloping hard down the declivity of Wouldham hill.

no assistant is at hand to take up the fore-leg, to make the horse stand firmly and immoveably upon the opposite one.

While in a state of flexion, some degree of lateral motion is possessed by the cannon; though the same no longer exists when the leg is extended. Lateral motion, in the extended position of the limb, could only have tended to diminish the stability and firmness of the standing posture, without possessing any countervailing advantage; but some degree of lateral mobility in the knee, in the flexed position of the limb—while the leg is in the air—enables the animal to round and collect his action, and direct his foot while *off* the ground and place it *upon* the ground, according as circumstances shall require of him. Some horses, we know, throw their feet outwards in going; some, inwards: foreign horses, especially, have the former kind of action; a good deal of which peculiarity in the flexion of the leg is effected through the lateral motion possessed by the knee-joint.

LECTURE VI.

THE FORE LEG OR CANNON.

As the knee of the horse is the part which anatomically corresponds to the wrist of man, so the fore leg, by the anatomist, is compared with that part of the human hand which extends from the wrist to the roots of the fingers; the *metacarpus*, as it is technically called. Hence the three bones composing the fore-leg in the horse are named, in accordance with the human metacarpus, the *metacarpal* bones. Carrying comparisons and names so far as this, however, appears, as Sir Charles Bell has aptly remarked, "losing the sense in the love of system." "There is no regular gradation," adds Sir Charles, in allusion to the many kinds of formation discoverable in the limbs, and other parts of animals, "but a variety most curiously adapting the same system of parts to every necessary purpose."

THE METACARPAL BONES, those that compose the leg, are three in number, viz. one *large* and two *small*. The large bone, one of the cylindrical class, and one that is particularly straight and round and smooth in its form, commonly goes by the name of *the cannon*

bone: an appellation given to it, I imagine, from some sort of resemblance it bears, it being perforated, to the barrel of a *cannon*, or else to a tube or pipe, which in Latin is *canna*, and from which our words *cannon* and *canon* are said to have been derived. The two small bones are very commonly called the *splent* or *splint bones;* either because they are the seats of splents or splints, or from their own resemblance to splenters or splinters of wood, or of other hard *splitting* substance. The cannon bone constitutes the shaft of support of the leg: above it and upon it, with the interposition of the knee, stands the arm; while its lower end rests upon the pastern bone. The splint bones, pyramidal in shape, and adherent to the sides of the cannon, taper downward into points, or rather terminate in small tubercular knobs, which have no resting-places—no articulation with any bone beneath them; the consequence of which is, that the *whole* of the weight they receive in the support they give the body must have been directly transmitted to the cannon bone, had they not been cemented to its sides by a soft elastic substance, something of an intervening nature between cartilage and ligament, which admits of their yielding downward;—"descending," as Professor Coleman's expression used to be—every time pressure from above is imposed upon them. And as the superincumbent weight, in accordance with the laws of the centre of gravity, bears more upon the inner than upon the outer sides of the limbs, so the inner splint bone is furnished at the knee with an independent joint, i. e. one of the bones of the knee-joint rests *exclusively* upon the head of the inner bone; which is not the case with the bone on the outer side, that receiving but *a part* of the articulation of the bone of the knee above it*.

This yielding downward or descent of the splint bones on the imposition of weight, and of the inner more than of the outer bone, and the instantaneous recoil of them, or ascent, the moment the active pressure has ceased, has long, by veterinarians, been regarded as one of many contrivances, operating, after the manner of a spring in the limb, to save the animal machine from receiving

* A reference to these parts in the skeleton will demonstrate what I have said.

that concussion which otherwise must necessarily result from its great action and speed: some of the weight or pressure which, otherwise, must all have been received in a direct line by the cannon bone, and from it have descended to the pastern, is now diverted for the purpose of setting these springs in operation, and thereby conferring elasticity and ease on the animal's movements.

Such has been the use ascribed by veterinary physiologists to these bones, and no question that I know of has been raised about its propriety, before Sir Charles Bell took it into consideration, and expressed his dissent from it. "I have some hesitation," says Sir Charles, in his Treatise on 'The Hand,' "in admitting the correctness of the opinion of veterinary surgeons on this curious piece of mechanism. They imagine that these moveable splint bones, by playing up and down, as the foot is alternately raised and pressed to the ground, bestow elasticity, and prevent concussion. The fact certainly is, that by over-action this part becomes inflamed, and the extremities preternaturally joined by bone to the greater metacarpal or cannon bone; and that this, which is called a splint, is a cause of lameness."

"I suspect, rather," continues Sir Charles, "that, in a perfect state of the joint, these lesser metacarpal bones *act as a spring to throw out the foot when it is raised, and the knee bent.* If we admit that it is the quickness in the extension of this joint on which the rate of motion must principally depend, it will not escape observation, that, in the bent position of the knee, the extensor tendons have very little power, from their running so near to the centre of motion of the joint; and that, in fact, they require some additional means to aid the extension of the leg."

"Supposing that the head of the lesser metacarpal bone," says Sir Charles, in explanation of the above, "enters into the composition of the joint, it does not appear that, by its yielding when the foot is upon the ground, the bones of the carpus can descend, as long as they are sustained by the greater metacarpal or cannon bone; I do not, therefore, conceive that this bone can add to the elasticity of the foot. But when we perceive that the head of the splint bone is behind the centre of motion in the joint, it is obvious that it must be more pressed upon in the bent position of the joint

when the foot is elevated, *and that then the bone must descend.* If the splint bone be depressed when the limb is raised and bent, and have a power of recoiling (which it certainly has), *it must aid in throwing the leg into the straight position, and assist the extensor muscles of the knee.* Further, we can readily believe that, when the elasticity of these splint bones is lost, by ossification uniting them firmly to the cannon bone, the want of such a piece of mechanism essential to the quick extension of the foot will make the horse apt to come down."

Supposing the horse's foot to be placed upon a perfectly level unyielding surface, and the weight from above to be thrown upon the limb in a direct line with the centre of motion, "it does not appear," as Sir Charles has observed, "the bones of the carpus can descend." But, supposing the animal's foot to be placed upon an uneven surface, or upon one that becomes so by yielding, may there not be such tilting of the carpal bones from the one-sided disposition of the weight expected to take place as will press downward the splint bone of one side, and so bring both bones into operation alternately or incidentally, as the case may be, depending upon the side to which the weight is inclined, which, commonly, is the inner one? According to this view, their operation is, of course, single, and independent of each other: according to former accounts, it was combined and simultaneous.

It is more than we dare assert, that the splint bone, from any pressure it receives in the bent condition of the joint, does not yield even to the extent of its elasticity, or to use the common phrase, though, as we think, an over-doing one, "descend;" but we certainly must pause ere we can believe such a trifling movement as this so-called *descent*, after all, can amount to, can have any effect in aiding "in throwing out the leg into the straight position, and assisting the extensor muscles of the knee:" too insignificant a cause, we conceive, to produce an effect so perceptible and so powerful.

Be the operation and use of these elastic powers what it may, few horses retain them after the adult period: the ligamentous elastic material becomes converted into osseous inelastic substance, and thus the three bones, in point of fact, consolidated into one. Do we discover any difference or alteration in horses' action on

this account? Is there any person can say, after he has mounted and ridden a horse, whether that horse have ossified splint bones or elastic ones? I have ridden numbers of horses in my time; and, as a general rule, certainly find that young horses possess more elasticity in their movements than old horses; and this is readily enough accounted for when we come to consider the number of animal springs there are in the body, all or most of which become impaired, and some altogether lost, in the course of age and work: among them, however, I should say those of the splint bones were probably the smallest in importance, and therefore would be the least of all missed.

In every horse that has splints this conversion of elastic into osseous union has necessarily taken place; and, as I said before, this is also found to be the case in every horse of a certain age, whether he shew splints or not: for the appearance of the splints is simply owing to *increased* or supplementary deposit of osseous matter, and is not the effect of mere ossification of the elastic substance. And this shews, when lameness arises from splint—which it occasionally, by no means always, does—that it is not attributable to the mere circumstance of the conversion of the uniting substance of the metacarpal bones from elastic into osseous matter, but is ascribable to the tumour, and we believe is caused by the straining or overstretching of the *periosteum*, the membrane which covers the bone. Were horses who had lost these springs to go lame, or even perceptibly roughly or jarringly, the preservation of them, and the ascertainment whether horses really possessed them or not, would become considerations of importance to us: since, however, we are, in truth, unable to say, from a horse's action, either on or off his back, whether these springs be in existence or not, we give ourselves, in practice, no concern whatever about them.

Short straight cannons are most desirable: as I have said in another place, length of arm and shortness of leg are *good points*—are signs of strength and action and endurance. While the distance from the elbow to the knee can hardly be too lengthy, that from the knee to the fetlock can hardly be too short: and the cannon bone should be straight in its position; neither inclining forwards, as in the calf-leg; nor directed backwards, as when the

fore limb, either from the length or position of the humerus, is running backward in that manner which gives the effect of what is called "standing over." The leg in form in the living horse should be flat and broad, not what is called "round:" the sinew should stand out far behind the bone, and feel tense, and distinct, and hard; and the interspace between the sinew and bone should give to the fingers the sensation of *a hollow*, a totally unoccupied interval, and not one filled up with soft substance, called, in horseman's phraseology, "gum." The cannon bone itself cannot be too large, providing there be breeding in the horse; and the only way to "judge of legs" is to *feel* them: by grasping them we ascertain their size; and by feeling them with our fingers we discover most surely what the proportion of sinew and bone is, compared with the weight to be carried. It is a frequent complaint, that horses are "small below the knee," meaning thereby that they are deficient in bone. In making this assertion, however, we should be careful not to be deceived by appearances; for the fore limbs will, now and then, have the appearance of wanting bone and sinew, when such is really not the case: in fine, the sole sure mode of "judging of legs" is to *feel* them—"run the hand down them," and span them; by which test one man can estimate a leg better in the dark than another, by simply looking at it, can in the light. It is very common to hear a gentleman say, "that horse is light below the knee;" to which the dealer, who *knows* his legs to be good, naively replies, "I think, sir, if you will *feel* them, you will not find any deficiency there!"

THE FETLOCK.

From the cannon we descend to the pastern, the two parts being connected by the joint known by the name of the *fetlock* or feetlock; so called from the lock or tuft of hair which grows from it.

The cannon, pastern, and coffin bones of the solidungulous animal bear evidence, in their formation, of that incorporation or consolidation of parts which we observe to take place in the scale of analogous structures, at the top of which stands the most perfect of digital formations, the human hand, at the bottom, immediately

below the cloven foot, the solipede or solid hoof; each losing something which renders it less useful as a hand, but gaining something which better adapts it for a foot, until all regard to the former is lost, and the latter remains paramount and exclusive. The cloven foot of the ruminant still maintains some clutch or hold upon the ground, but the undivided hoof of the horse is deprived of all this: that, *in its shod condition,* cannot be said to take any further hold upon the earth than what is mechanically derived from the pressure caused by the superincumbent force or weight, from the unevenness of the surface of the foot, from impress of it upon yielding ground. In the same manner that the cannon bone of the horse can be demonstrated to consist of an union of two metacarpal bones, so the pastern bones may be said, each of them, to be constituted of two united phalanges, and the coffin of a junction of the two separate or semi-coffin bones of the cloven foot.

The lower end of the cannon-bone has two roller-like, smooth, and polished surfaces, which play within correspondent concavities upon the summit of the pastern bone: the position of the latter, however, being obliquely forward, while the former stands in a perpendicular line, a large vacuity would necessarily be left behind, were not the sesamoid bones placed there for the purpose of completing the joint. These two little supplementary bones are kept in their places by ligaments, two running crosswise, attaching them to the pastern bone; but their mainstay, that which principally upholds them, and admits of the play or motion of them during the action of the fetlock joint, is the *suspensory ligament.* The sesamoid bones are so bound to the supero-posterior part of the pastern, that the three together form a cylindroid dish-like hollow, into which is received the lower end of the cannon-bone; and the weight from the latter preponderates upon one or other of the former, depending upon the obliquity or line of direction the pastern takes on leaving the cannon in its course to the foot. When the pastern deviates but little from the perpendicular of the limb, it is said to be "straight," and is almost always made "short;" so that short and straight pasterns are consentaneous formations: the reverse, short and slanting pasterns, being incompatibles, or at least such a combination as is rarely seen, and is attended with disadvantages both of strength and action. When, on the other hand, the pas-

tern forms, in leaving the cannon, a considerable angle, it is said to be "oblique," and is almost always extended in length, so as to assume the denomination of "long" or "lengthy:" this is a disposition of parts which also has its peculiar advantages, and one that would have its objects defeated or much abridged by any disproportionate shortening with the obliquity.

In proportion as the pastern is upright in position, less weight is imposed upon the sesamoid bones, more upon the pastern bone, and *vice versâ*. What pressure or weight the pastern-bone receives descends to the coronet, and thence to the coffin-bone. But what becomes of the weight imposed upon the sesamoids, they having no bones below to transmit it to? They are in a somewhat similar situation to the splint-bones; they call upon their attaching bands—their *ligaments*—to support them under the load; and their ligaments do so by yielding—they being elastic—so long as force is operating; and the instant it is not, they, through elasticity, again recover their short lengths, and so raise the sesamoid bones into their places. This descent and ascent of the sesamoids is not to be compared with that imperceptible and disputed motion of the splint-bones; on the contrary, it is a demonstrable and beautiful descending and ascending operation—a playing down and up, after the manner of a spring of most elastic and exquisite workmanship; imparting, at every step the horse takes, its anti-concussion influence to every part of his frame. Watch the long and elastic fetlocks of the Arabian or race-horse, as he is cantering upon turf, and at every bound he makes will the tufts of hair from those joints be seen dipping upon the ground; though, while the animal is standing still, they may be some inches even removed from the surface. Nothing can evince more beautifully and plainly than this the movements of the fetlock-joints.

The elastic band or ligament upon which the sesamoids repose in their descent, and depend for their re-ascent, is the *suspensory*. And, in order to shew what proportion of the superincumbent weight these bones sustain, or, rather, how insufficient the pastern is without their aid to support the burthen, we have only to cut the suspensory ligament through: that done, the horse is, in real truth, "broke down;" the feet slip forward, and the toes turn

up, while the fetlocks bend down upon the ground. Not so after division of the flexor tendons: we occasionally sever them by way of remedy for "knuckling over," and all that results is, the enabling or necessitating the animal to set his heel upon the ground: once divide the suspensory ligament, however, and no power left is able to maintain the pasterns erect. The suspensory ligament is, therefore, one of the mainsprings of the machine in action—one of the chief of those beautiful contrivances, which, while they save the leg-bones from being shivered to pieces under the force and shocks they have to sustain at every bound and leap the animal makes, insures himself and his rider ease and safety to their journey's end.

I have instanced the Arabian and the racer as most strikingly shewing the operation of the spring of the fetlock-joint, the limbs of horses of high breeding being characteristically remarkable both for the length and for the obliquity of their pasterns: other horses will evince this springiness in proportion as their pasterns possess the necessary length and obliquity, and such as have short and upright pasterns—cart and dray-horses—will possess it in the least degree. Why should this be? Was not elasticity and defence against concussion required in the cart-horse? Yes! to a certain degree; but not in like degree with the property of strength: he is an animal designed for feats of strength, his movements under such performances being tardy and measured; altogether unlike the race-horse, whose movements are required to be airy, and fleet, and bounding, with loads of the lightest description upon his back.

The late Professor Coleman—in his work on "The Foot of the Horse"—has thrown excellent light upon this part of our subject: "While the animal is at rest," says he, "and also during motion, these (sesamoid) bones sustain part of the weight; and where the pastern-joints are long and oblique, the sesamoid bones often receive so much of the weight as to put the ligaments violently on the stretch, and occasion lameness. This effect also may ensue in consequence of the heels of the hoof being improperly cut down, or the toe allowed to grow too long, or the heels being first raised by a high-heeled shoe, and that suddenly changed for a shoe with thin heels. All these causes, however, whether separate or combined, do not operate with so much violence in the hind as in the fore legs.

The additional weight of the head and neck to be sustained by the fore legs, renders all their springs more liable to injury and decay than the corresponding parts behind."

Although the fore limbs actually support more weight than the hind, and receive shocks of concussion unknown to the latter, and on these accounts become the ordinary seats of lameness, and are often seen worn out while the hind legs continue serviceable, yet, we must not pass by unnoticed that which, in this instance, would seem to have escaped the observation of the Professor, viz. the great deal the hind legs have to do as the agents of progression, and the consequent frequency of failure in the hind fetlock-joints. We know that many of our first hunters and racers become incapacitated from what is called "breaking down behind;" and we have no reason to feel surprise at this, when we consider the work these joints have to perform in progression: next to the hock, indeed, there is no part of the hind limb so forced and strained as the fetlock. One of the best race-horses this country ever produced—the Colonel—failed from this cause; and no effort on the part of Mr. Goodwin could set him up again upon the turf. Harness horses, employed in laborious draught, are very apt to fail in their hind fetlocks, these being the joints upon which so much stress is made in strenuous efforts in drawing up hill or along heavy roads. The greater the exertion the fetlock-joint is put to, the greater the flexion of it, and consequent stress or strain upon the sesamoids and their tendinous and ligamentary supports, producing either overstretch of them, or laceration of some of their component fibres at the moment, and thus occasioning immediate lameness; or else, by a repetition of effort, in time impairing or destroying their elastic properties, and thus inducing that relaxation and puffiness of the joint which we constantly observe in horses who have been, in the manner described, for years subjected to hard work.

Two circumstances, then, influence the quantum of stress or weight imposed upon the sesamoids,—the degree of flexion of the fetlock-joint, and the position, straight or oblique, of the pastern; and both these circumstances are, in a measure, under our control. We cannot, it is true, lengthen or shorten the pastern; but it is in our power, by means of shoeing, to alter the position of it: "The heels of the hoof being improperly cut down, or the toe allowed to

grow too long, or the heels being first raised by a high-heeled shoe, and that suddenly changed for a shoe with thin heels," are all causes which, says Professor Coleman, put the sesamoids on the stretch, and, on occasions, do so, no doubt, to the injury of their ligamentary connexions. There is not, however, so much harm done in this way as people in general imagine. Certainly, art cannot more insult nature than by suddenly and unpreparedly altering the habitual condition of any part of the body; and were a person to set about to produce lameness, perhaps he could hardly resort to a more effectual expedient than that of momentarily changing the relative position of the parts composing the fetlock and pastern joints, either from an upright to an oblique, or from an oblique to a straight position; indeed, were the surface upon which the horse treads like that of the table upon which we are writing, level and unyielding, injury might be certain to result. But, as matters stand, in the first place, there is almost always more or less yielding of the ground under the horse's feet to counteract the effects of this unnatural bearing of parts, and, in the second, there is inherent in the parts themselves *a power of adjustment*, sufficient, we believe, on all ordinary occasions, to ward off injury to them until such time as they shall be able to accommodate themselves to their new situations, or even, for a time, while the horse is going upon what may be compared to the table, viz. wood-pavement. We do not deny the mischief that *may* accrue from injudicious heightening or lowering of the heels of the foot by shoeing; we only have less apprehension of the consequences, on account of the yielding nature of the ground and the adjusting power of the parts themselves, than appear to be entertained by horse people in general.

LECTURE VII.

THE HIND LEGS.

"—Whereas, the narrow pin buttock, the hog rump, and the falling buttock, are all natural deformities, and in general render the creatures to which they belong unfit for either pad or pillion."—*Farrier's Dictionary.*

THE three bones below the pastern, properly speaking, belong to the *foot;* a part I shall defer the consideration of until we have completed the present series of lectures "on Form and Action:" in accordance with this plan I now proceed to the hind extremities.

In my description of the fore limbs, I observed that they differed materially from the hind ones in their superstructural divisions, notwithstanding that below the knees and hocks there existed, both in the living and dissected subjects, every identity between their structures: the osseous fabric of the fore limb exhibits, as a whole, a tolerably fair representation of the limb of the living animal; but than the haunches of the living horse and the parts representative thereof in the skeleton nothing can be more unlike. The framework of bones composing the hind quarters* exhibits a bold, rugged, zigzag structure, remarkable only for its irregularities, having here a huge projection, there a large void, with such a disposition of the component pieces as to offer every advantage, consistent with the general conformation, to the muscles that once filled the vacuities, and had their attachments to projections so strangely, yet wisely, shapen and disposed. The hind limbs are the agents of progression: though the fore contribute to the operation, they are no more than auxiliary forces, not absolutely requisite, and only on occasions called into action. This accounts for the especial development of the hind quarters in quadrupeds of speed, or such as are gifted with extraordinary powers of saltation, such as kangaroos. In surveying the points of a race-horse, the practical man on the turf sets great value on

* "Hind quarters," and "quarters" are expressions used here and in other places in the sense of *buttocks.*

one that is big-haunched; knowing well, that, *cæteris paribus*, a horse so made cannot be far behind his competitors in the race.

THE PELVIS is the name given to that irregular quadrangle of bone which, completing the skeleton posteriorly, constitutes the framework or basis of the rump and hips*. It is formed by the counter-position and part union of the two hip or haunch bones, and by the sacrum or rump-bone, which is let in between them, and makes a sort of roofing to the cavity of the pelvis. In an anatomical point of view, the pelvis is a part of considerable importance, from the circumstance of its lodging within its cavity the urinary bladder, and the organs of generation in the female: to us, on the present occasion, it is of importance chiefly on account of its position in regard to obliquity, its shape, and its magnitude, and the consequent facility it affords the femoral bones in their motions, and the leverage it offers to the muscles attached to it. A small or narrow pelvis cramps the viscera within it, leaves insufficient space for the *fœtus in utero*, and produces, exteriorly, what is called "falling-off in the hind quarters"—small rump, and flat and lank haunches.

A large or wide pelvis throws the hips further apart, making the animal "broad-hipped," or, as he is denominated when the hips are unusually prominent, "ragged-hipped;" there being, as would appear in the latter case, some deficiency of muscle. Within limits, breadth across the hips is desirable. Cart-horses can hardly be too broad and big about their hind quarters: not so, however, with horses intended for speed. For it must be remembered, that by the increase of the distance across from one hip to the other, the hip-joints, in which the femoral bones perform their motions, are also removed farther apart, wider from the centre of gravity; the consequences of which are, inability on their part to balance the machine and move it, in progression, with the same effect as when they are nearer together. The broad-hipped horse will "stand over more ground," crosswise, than the narrow-hipped one, and will, on that account, maintain a surer standing; but should he attempt in action to place his feet underneath his body at all centrically, he will only be able to take short steps in advance, and should he not

* See the skeleton at page 7.

attempt this, his wide gait must make his burthen the greater. Broad-hipped horses, in their gallop, cannot throw their hind feet centrically forward in progression in the way racers are required to do. They will possess stability and strength in action, but their freedom or extent of action will be diminished; neither will they possess the same facility in turning sharp or quick as horses of a different make. One of the broadest-hipped horses I ever knew belonged to an officer of the Guards, and of him great complaints were made about his "rolling and awkward gait behind," and his inability to "turn about and wheel round" with the required promptitude; the consequence was, that he lost his place as a charger, and was sold as a harness-horse. In a general way, horses measure about twenty inches across from hip-bone to hip-bone; though some will run as much in their measure as twenty-two, while others will not exceed nineteen inches. I do not find, as in human beings, any notable difference between the width of the pelvis in the male and female horse.

Although the race-horse may prove disadvantageously broad across his hips, I believe he will never be found either too *lengthy* or too *straight* in his quarters; by which I mean, the length and elevation of an imaginary line carried from either hip to the point of his quarter, or of another carried from the summit of his rump to the root of his dock. Such straight formation of quarter implies small degree of declination in the position of the pelvis, the effect of which is extension of the angles between the pelvis and the femoral bones, and correspondent increase of the distances between the pelvis and the stifles in front, and between the pelvis and hocks behind; thereby augmenting the dimensions of the muscles running between these salient points, and at the same time furnishing them with, under the circumstances, the greatest advantages in their action. Length and straightness in the quarters must, therefore, be regarded as characteristic attributes of the race-horse.

Genuine hackneys, and many good hunters too, possess quarters the reverse of this in form; more, in fact, like that of cart-horses; and, when it is considered that the former are desired for their walking and trotting paces, and the latter in their gallop to carry great weight, we need feel no surprise at this: blood quar-

ters would have given them increased galloping speed, but they could, with the augmented stride, neither have carried the required weight nor maintained the stability and firmness of step requisite for heavy draught, and, therefore, they would not have proved so valuable either upon the road or in the field. On this account the short-quartered horse is often to be preferred to the lengthy one, even for the purposes of hunting; though, of course, should there be found—as nowadays there often is, from our extensive increase of blood—lengthy quarters possessing the requisite strength, they will in the field surpass all the cocktails*. Still, do the latter retain one advantage over the blood-horse: with their short and strengthy quarters, they commonly inherit powers of leaping, and cleverness in getting over awkward places, for which the long greyhound-like quarter of the racer seems ill adapted. The same remark may likewise be made in respect to the manege: horses with racing-like quarters never perform so cleverly with their haunches as others; they have difficulty in getting their haunches under them, and from extreme elasticity, manifest "weakness" in them, on which account thorough-breds rarely turn out accomplished military chargers. We know that Irish hunters are proverbially good leapers; and they are remarkable for their short, high-rumped, any thing but handsome, quarters: withal, however, they perform wonders in jumping, particularly in the hunting field, and this they are enabled to do from great breadth and shortness, combined with uncommon muscularity of the hind quarters.

The cart or dray-horse, the cob, the hackney to carry weight, are all valued the more for their large, rotund, plump quarters. Lank or lengthy quarters, such as would be admired in a racer, are, in these horses, detractive from their worth and beauty; as much, in fact, out of character, as round and full quarters would be upon a race-horse. This shews how necessary it is, before we pronounce on the aptitude or inaptitude of these parts, to first determine the breed of the animal, or for what purpose he is intended. The quarters may be "good" of the kind, and yet of a character unsuitable to the breed or make of the horse, or they may be of a description in keeping with the breed and conformation of the

* Half-bred horses, with short round quarters, from their tails being carried erect, are commonly so called.

individual, and yet "bad" of their kind. The quarters of the thorough-bred may possess the due length and straightness, but may be wanting in defined boldness of projecture, and be deficient in muscularity, thereby flat and lank and powerless.

Again, the quarters of the cart-horse may be characteristically short in their various dimensions, but may prove defective in bulk and plumpness. The length of the loins must a good deal influence the make of the hind quarters: shortness and compactness in the one would ill consort, both in appearance and action, with lengthiness and elasticity in the other; and it is not often that we observe any disagreement in this respect.

We meet, every now and then, with horses whom we admire in every respect save that they "fall off" or are "plain" in their quarters. The rump is small and altogether out of proportion to other parts, or it is one of a "drooping" character; or else, from disproportionate breadth and squareness, and great prominence of the hips, the quarters assume an ugly "ragged" appearance. These broad and ragged quarters, providing the thighs and hocks are of strong make, in general possess great efficiency in action. Many of our best trotters, such as are known to be capable in this line of feats both of strength and action, will be found to have quarters of this description with extraordinary development of power in their thighs and hocks. A horse can hardly be made worse in these parts than to possess an extended narrow loin, rising in a line, rather concave than otherwise, from a dip in the back to the summit of the rump, with buttocks drooping from this elevation, having flat or hollow surfaces, and yet being lengthy in their dimensions, with a tail set on as low down as it is possible for it to be. Such a horse will be light-carcassed, tucked up in the flanks after work, and, from want of power in his propelling agents, prove incapable of "carrying weight" or "getting through dirt," or of dragging any thing in the shape of a load.

The hind quarters being the agents of propulsion of the machine in action, durst we attempt to consider them apart from the fore limbs, or to institute any comparison between the two, we should certainly rank them in the highest place in our estimation; i. e., for all purposes of work, a horse with "good" hind quarters and "bad" fore quarters ought, undoubtedly, to be preferred to one with the

reverse qualifications: he would carry greater weight, draw a heavier load, and probably not so soon tire. But, perhaps, as was observed on a former occasion, the hind limbs would do too much for the fore in action, and the consequence would be—from the fore legs not being able to act in consort with them and to "get out of their way"—falling down, forwards. Another evil might be, a most unpleasant jarring, stilty, falling-down sensation to the rider, amounting, perhaps, to a total unfitness for the saddle, and even incapacitating the horse for any thing but slow work in harness. After all, therefore, however efficient his "good" hind quarters may render him, want of any thing like commensurate "goodness" in his fore ones would render his admirable qualities behind of little avail. In fine, we may and do, for certain purposes, such as light pleasure riding and driving, &c., make good fore-quartered horses very useful, although their hind parts are any thing but what we would desire them to be; but, for the reasons stated, the reverse conformation proves now and then such as to render the animal totally worthless, unless it be, as I said before, to go a foot's pace in a higgler's or market-gardener's cart.

THE HAUNCH AND THIGH.

The divisions of the hind extremity are, the *quarter*, *buttock* or *haunch*, the *thigh*, the *cannon* or *leg*, the *pastern*, the *coronet*, and the *foot*: the joints connecting these parts to each other being, the *hip joint* or *round-bone joint*, the *stifle joint*, the *hock joint*, the *fetlock joint*, the *pastern joint*, the *navicular joint*, and the *coffin joint*.

When we come to examine the skeleton and consider the bones of the hind extremity in reference to the parts denominated "thigh" and "leg" in the living animal, we find the same discrepancy prevailing as was noticed on a former occasion in regard to the fore extremity. The *os femoris*, so named by anatomists because it corresponds to what in the human skeleton is the true thigh-bone—in the quadruped becomes an *os ischii* or haunch bone; while the *tibia* and *fibula*—the bones of our leg—appear in the horse as *ossa femoris* or thigh bones. Pursuing this analogical investigation, we discover the *heel* of man to be converted into the *hock* of

the horse; and the bones of the *hands* and *fingers*, by union, consolidation, and great additional length and development, to be made, in four-footed animals, into legs, pasterns, and feet. Man being the peculiar object of the anatomist's study, the prototype of all his other inquiries, the standard to which all his comparisons are referred, we need feel no surprise that the bones of the parts we are engaged in considering should have received names, according to horsemen's views, so inapplicable to them. To prevent any misunderstanding or mistake, however, we must continue these appellations; we must still call that bone which, in the living horse, constitutes part of the haunch, *os femoris*, and that which really forms the thigh, the *tibia*.

The appellations, *quarter*, *buttock*, and *haunch*, appear synonymous: at least it is difficult to say what distinctions they admit of, or to define where one ends and the other begins. Haunch or *hanch* is a French word, used to denote *cette partie du corps ou l'impoita la cuisse:* by us it is often used for buttock and thigh combined. Shakspeare, in his Henry the Fourth, has used the word in a sense and with a force of expression peculiar to himself alone:

> "Thou art a summer bird,
> Which ever in the *haunch* of winter sings
> The lifting up of day."

When we say a horse has "fine haunches," we mean to include his thighs and buttocks: the thigh of the horse indicating the part of the limb extending from the stifle to the hock.

The OS FEMORIS, the lower haunch-bone of the quadruped, is similar in its shape and relations to the same bone in the human frame, but is, in a remarkable degree, a *short* bone; whereas in man it is the longest bone in the body, long thighs enabling us to take long steps, affording increased space for muscle, and giving us peculiar advantages on horseback. Long thighs are likewise advantageous for quadrupeds; but in them, as has been already explained, the os femoris constitutes no part of the thigh. Though articulated by means of a ball-and-socket joint with the pelvis above it, and by a condyloid or hinge-formed joint with the tibia (the true thigh-bone of the horse) below it, the same as in man,

still it is surprisingly short; at the same time, it is certainly the strongest bone in the body, on account of this shortness being combined with extraordinary development of its shaft and extremities. Had Sampson armed himself with the femoral-bone instead of with the jaw of an ass, he would have found his weapon for combatting the Philistines a greatly more efficient one.

Any disproportionate length of this bone in the horse would have thrown the stifle too low down, out of its natural and proper situation, which is on a level with the inferior line of the body and with the elbow, the joint in the fore extremity to which the stifle corresponds: the only augmentation in length the bone admits of being that which it derives from straightness in the quarters, or the least possible declination in the position of the pelvis. The straight and lengthy quarter, therefore, it is which has—providing the depth of the carcass be undiminished—the greatest length of femoral bone; the short and drooping quarter, the least. Here presents itself another instance to shew that when stride or speed is required length is given: a horse with long femoral bones will be enabled in action to throw his hind feet farther forward than another with short ones; that motion in the hip-joint which will advance the short bone as equal to three will project the long one as equal to four.

I said the hip-joint was of the ball and-socket character, and therefore it possesses, to a greater or less extent, a rotatory motion. Through its means it is that the animal has the power of "tucking his haunches in," or placing his hind foot centrically underneath his body, in the position, of all others, the most effective for the propulsion of the machine in action: unless from the breadth and position of the pelvis, and the connexion with it and conformation of the hind limbs, he derive this power from the hip joint, from no other joint, from want of the rotatory power, can such action proceed. It is quite a mistake to suppose that such "tucking in" can be produced by the hocks, they admitting but of simple flexion and extension. Both the fore and hind extremities derive what faculty of lateral and rotatory motion they possess—the power of throwing the legs and turning the toes inward or outward in action—from ball-and-socket joints: the fore extremity from the shoulder joint, the hind extremity from the hip joint.

There is this important difference, however, in the construction of these correspondent articulations: the os humeri is placed beneath the scapula, in such a situation that the weight of the body comes directly upon its head; whereas, in consequence of the head or articulatory part of the os femoris, instead of forming the summit of the bone, being laterally placed, at a right angle to the shaft of the bone, the weight is transmitted, not perpendicularly upon the os femoris, but in an oblique or indirect line. One reason for this appears evident, in the different relations to the body existing between the shoulder and hip, the latter being in consolidated connexion with the body itself, the former attached only through the intervention of muscle. The lateral position of the hip joint serves, in a measure, to compensate for the want of that elasticity and spring which the shoulder derives from its muscular attachments, to counteract or mitigate any shock or concussion the limb may sustain in action, such as from jumping, &c. There is another and a greater advantage, however, resulting from this position of obliquity. At the time that the weight of the body is pressing with its greatest force upon the hip joints, from the pressure being sideways instead of perpendicular, their motions under the weight are, comparatively, easily carried on—the work of progression is saved that hinderance and difficulty which would have attended the direct imposition of weight upon these joints, to say nothing about the friction and wear from concussion the joints themselves must necessarily have sustained. A third reason for placing the head of the os femoris in an angular position, and setting it off from the shaft or body of the bone by means of a *neck*—for so the intervening portion of bone is called—is, that the joints might possess an enlarged sphere of motion. In the fore extremity, the scalpula itself being a moveable bone, the humerus did not require this; but in the hind, the pelvis being a fixture to the trunk, it was necessary to confer as much mobility upon the hip joint as was compatible with the strength required in it to carry the weight of the body and to guard against any risk of dislocation. Had anything like the force resulting from weight and action been in operation in the fore extremity the same as in the hind, the shoulder joint could never have admitted of the loose and superficial construction it at present, for the sake of motion, enjoys. It

must have been furnished with the deep socket and complete reception of the ball into it, which we observe in the articulation now under our consideration.

A beautiful contrivance, however, in defence of dislocation, whether it be likely to happen from the extensive motion enjoyed by the hip joint, or from the resistance it opposes to the force of the weight and shocks it receives, is the *round ligament*, as it has been named; a ligament or round cord, characteristically short and strong, one end of which is affixed to the centre of the spherical head of the os femoris, while its other end is rooted into the floor of the socket in which that head plays: thus in nowise interfering with the revolutions and turnings of the ball within its socket—in nowise limiting or abridging the movements of the hind limb, and yet most effectually, in all those varied movements, preserving the hip joint from dislocation. By the depth of the *acetabulum*, for so the socket in the pelvis is called—which in the recent subject is still further deepened by an edging of cartilage or gristle, whose flexibility admits of all the required latitude of motion; by the round ligament; and by the thick and powerful muscles by which it is on every side invested, is the hip joint preserved from displacement: indeed, without rupture or laceration of the round ligament it is impossible for dislocation to take place.

Another remarkable feature in the os femoris is the huge ill-shapen projection proceeding from its upper and posterior part, which has got the name of *greater trochanter*, by way of distinguishing it from a process much less in magnitude arising from the body of the bone. This protuberant portion of bone may be regarded in the light of an elbow, or a hock, or any other projection whose use is to serve as a lever of the most favourable description, compatible with the situation it is in and to the muscles to be attached to it. Into the great trochanter are inserted those powerful muscles which extend the haunches after they have been flexed and advanced underneath the body, and in this act of extension propel the machine forward: no wonder, therefore, that it should have been constructed, in respect to magnitude and position, in a manner to offer the greatest possible leverage. When we see the quarters straight and lengthy, and the stifles prominent and jutting well forwards, we may take it for granted that the

trochanters partake of the increased length of the femoral bones: the reverse of this—short quarters and drooping or rounded stifles—shewing that the femoral bones are short, and their trochanters likewise.

Taking a side view of the quarter, three prominent points attract attention; the *round-bone* above, the *point of the quarter* behind, and the *stifle* in front; which three prominences may be said to constitute the lateral boundaries of the quarter, and, by their relative distances from one another, and their degrees of prominence or projection, principally to determine its lateral form and dimensions. It will be remembered that the point of the quarter owes its existence simply to a process of bone; whereas both the round-bone and stifle are constituted of joints, are not fixed but moveable parts; not so much parts *from* which muscles act as *on* which their action operates. The round-bone joint we have already considered; we will now pass downward to the

STIFLE.

This joint is one of peculiar and beautiful construction—one from which it would appear the idea of that mechanical power and useful invention, the pulley, took its origin. The joint is formed by the adaptation of the lower or condyloid end of the *femoral bone* to the upper end of the *tibia*, with the super-addition, in front, of the *patella*. The condyloid projections of which the lower end of the femoral bone is constituted revolve within ovoid, shallow, cup-like cavities excavated in the top of the tibia; but so superficial are these cavities, or rather depressions—so incommensurate with the condyles revolving in or rather upon them, that, in the angular position in which the femoral and tibial bones relatively stand, were it not for the super-imposition of the patella, the front of the joint would be left dangerously insecure and entirely unprotected.

THE PATELLA, or stifle-bone, of the horse, corresponds to the patella or knee-pan of a man: their anatomical situation and relations are the same, and they answer similar purposes in both animal machines. However irreconcileable with any notions of relative situation it may at first appear to an unprofessional mind, the stifle of the horse is regarded by the human anatomist as his

knee, for the same reason that the veterinarian would look upon the knee of a man as his *stifle*. One grand difference, however, between these structures is, that, in man the femoral bone stands perpendicularly upon the tibia, whereas, in the quadruped the bones are placed at a right angle, almost, in regard to each other: a circumstance from which we may infer that the patella was not added for the purpose of making the joint complete so much as for the grand object of serving as a pulley and a lever to the muscles engaged in the important business of extending the thigh under the body and aiding in progression. The biped—man—is enabled to maintain his erect posture with comparative ease, or at little expense of muscular action, by means, principally, of large and powerful muscles inserted into his knee-pan: were the knees not kept straightened the stability and strength of the standing posture would be lost: when from weakness, or any other cause, the extensor muscles lose part of their power, so that the legs cannot be completely straightened, we know how insecure the standing is, to say nothing of the awkwardness and infirmness it occasions in progression. Even after a man has had fracture of one of his knee-pans, and the fractured divisions of bone have united—as they commonly do through the interposition of ligamentous substance—the increased length of the pulley and consequent diminished effect resulting from the contractions of the extensor muscles, occasions halting in the walk, and detracts from the stability of the standing posture. To the quadruped these observations are not altogether strictly applicable. Standing, as he does, upon four legs, and these being so placed that the body is mechanically supported by them, after the manner of a stool or form upon its four supporters, but very little muscular action is necessary to keep him standing; and although the muscles affixed to the patella contribute to this function, yet is that office comparatively trifling to the one they perform in the work of progression. When the hind limbs, through the agency of the flexor muscles, have been raised or flexed to their utmost, then do the extensor muscles come into play, projecting the limbs underneath the body, and pointing the toes forward, in order that they may become fixed points upon the ground, and serve as *fulcra* in the working of the machine onward.

We may, therefore, fairly ascribe three functions or uses to the patella. Firstly, it serves to complete the stifle-joint in front, and to protect it against injury coming in that direction. Secondly, it forms a pulley, playing over the condyloid surface of the femoral bone, and thus greatly facilitating the action of the extensor muscles. Thirdly, it may be regarded in the light of a process, though a moveable one, giving the muscles inserted into it the advantage of considerable leverage in their operation upon the thigh: consequently, the more prominent the stifle-bone is, the greater the power given to the muscles. Were there no stifle-bone existing, the tendons of the extensor muscles of the thigh would have to play over the bare condyloid cavity of the femur, under the disadvantage of increase of friction and loss of leverage; and had the bone been fixed instead of moveable, the projection from the head of the tibia must have been of a lengthy and awkward shape, and, withal, would not have conferred the same power and facility of action on the muscles which they possess at present. Perhaps nothing more strikingly demonstrates the utility of the patella than the accident of its *dislocation:* the bone has no sooner slipped out of its place than all power of extension of the thigh is lost; and the result is, dragging of the toe of the hind leg upon the ground, the animal having no power to advance the limb underneath the body. The bone, in being dislocated, has got into a situation in which it is rendered a fixture, and the muscles consequently become powerless. The instant, however, the bone is righted, all power and action are restored, the same as if nothing had happened.

The operation of the muscles implanted into the patella, and through its medium into the tibia or true thigh-bone, is, then, extension of the thigh, and thereby bringing the leg forward underneath the body, preparatory to the effort of progression; the act of progression itself being, as we shall hereafter discover, mainly effected by the muscles inserted into the hock, assisted, however, by those of the patella. Action in the hind extremity is commenced by a general flexion of the limb—flexion of the femoral bone on the pelvis, elevating the stifle against the body; flexion of the tibia and hock, raising the foot off the ground, and preparing the limb for projection underneath the body: then comes the act of straight-

ening to throw the limb forward, and the continuance of the same act it is, enforced by additional powers, which propels the machine in progression. A well-formed stifle is, therefore, a point of some importance, and the best-formed joint of this description is that which, from the sharpness of the angle between the femoral and tibial bones, is forced well forward and upward towards the body, and at the same time discloses through the skin the prominence of the patella, but particularly that of the rectus muscle above it. The prominence of the stifle, it is evident, must depend upon the obliquity of the position of the femoral bone, and the sharpness of the angle formed between it and the tibia: in one instance, the stifle will appear bold and obtrusive, abutting almost against the belly; in another, it will be seen situated low down upon the thigh, quite away from the belly; and this latter is the stifle of all others which indicates, as far as it and its connexions are concerned, want of power and action in the hind quarter.

THE THIGH, OR GASKIN.

What horse-persons now understand by the *thigh* of the horse is the part between the stifle and hock joints; a part, anatomically regarded, that corresponds to the human *leg*. In the young animal it is composed of two bones; but these bones are united by an elastic (cartilago-ligamentous) substance which, as the animal approaches the adult period, becomes gradually converted into osseous matter, until at length the two bones become in reality one and the same solid structure; so that in every horse of full growth it would be but in accordance with truth to say, the thigh was composed of a single bone. The tibia presents upon its superior end two ovoid superficial depressions, which are, by the addition of cartilaginous interventions, rendered deeper and better adapted to receive the condyles of the femoral bone, the one moving upon the other in extension and flexion, and having some little lateral motion. The lower end of the tibia is smaller than the superior, the bone tapering rather from top to bottom, and is shaped so as to accommodate itself to the construction of the hock-joint.

The chief considerations touching the thigh or gaskin are, its *position*, its *length*, and its *thickness* or muscularity. In accord-

ance with the harmony of natural formations, where the haunches are straight and lengthy the thighs become lengthy and receding: in horsemen's phraseology, they are well "let down;" and the consequence is, the hocks are *low*, and the cannons *short*. The hind quarter, in fact, altogether, has the turn and appearance of the greyhound, and is evidently well adapted for purposes of speed. And, providing all this be accompanied by the requisite substance or muscularity of parts, a quarter of such a character in a race-horse must be regarded as one of his very finest and most admirable points. This, in fact, it is that constitutes the veritable *blood quarter*—the quarter every man who is seeking after breeding and speed is ever looking for. And when found with "the thighs let down into the hocks," or, in other words, with muscle and sinew from upper end to lower, nothing can surpass it for speed in the gallop and bottom in continuing it.

I have observed that length and obliquity of thigh are, commonly, correspondent formations; but they are not necessarily so: we now and then meet with thorough-bred horses with straight and lengthy quarters, and extreme length of thigh, and yet the thigh is so *straight* that its line of descent approaches even the perpendicular. I remember a racer—"Wouvermans"—who was most remarkably straight and lengthy in his gaskins, and yet he performed with considerable *éclat*. In these cases, length of thigh affords great stride, and muscularity tells in maintaining it; but in the absence of obliquity it is impossible there can be that spring or elasticity in the movements which is likewise a great promoter of speed, and which must ever tend to render the production of speed less expensive to the animal machine. Some greyhounds are very straight-thighed; but hares and rabbits, and many other animals of great speed, possess extreme obliquity, as well as length, in the conformation of their hind limbs. It may be that the oblique hind quarters are the most suitable for efforts of bounding or leaping; and that, as such, they are of more value in hunters than in racers.

THE HOCK.

The hock—the old and proper spelling of which is *hough*—of the quadruped is the same as the heel of man; the os calcis being the bone, in both instances, by which the projecting parts, commonly distinguished by these appellations, is formed: the hock-joint, altogether, being correspondent to our ancle-joint. The joint, either as hock or ancle, is composed of six bones, being a sort of correlative structure to the *carpus* or knee; but why so many pieces enter into its composition is not very apparent, either in the instance of knee or hock, wherein, as far as the motion of the joint is concerned, but two appear absolutely requisite. In a situation where so many pieces are placed to receive the jar or shock, and where these pieces are reposing upon elastic cushions, concussion must, no doubt, be very much counter-acted; to my mind, however, this does not altogether account for the curious mechanism displayed in the instance before us, as well as in some other parts of the skeleton. The lower end of the tibia has two deep furrows or grooves running obliquely across it, and these are fitted with admirable precision to a pulley-like surface presented upwards by the main bone of the hock, the *astragalus*, upon which the tibia rests; and between these two bones, the tibia and astragalus, is carried on almost all the motion of which the hock is capable, they being excellently adapted for the work by the pulley-like articulation just mentioned. Where is the utility, then, of the other five bones? Whatever uses we may be able to attach to the remaining four, the purposes served by one of the five, the os calcis, become too obvious to admit of any question. *The point of the hock*, that lever of more power than any one in the machine besides, through the aid of which the muscles most of all others concerned in progression are enabled to perform their great work, consists of the *os calcis;* this of itself being the part, as I observed before, which commonly goes by the name of the hock. When horse-persons talk about horses having "good" or "bad" hocks, they allude, for the most part, to the position and length of this lever. I heard a man, a good judge, say on a race-course on one occasion, "Shew me the horses' *hocks*, and I will point out the winner." In

a word, if there be one "point" about horses of more importance than another—one that cannot be tolerated badly formed or imperfectly developed—that point is *the hock*. What, then, is it that constitutes "a good hock?" Firstly, and principally, it ought to be *large* in proportion to other parts: a disproportionably *small* hock can never prove equivalent in power to a large one of the same quality. On a lateral view, it should appear *broad;* and, on a view from behind, bulky and bony. And, then, the *point* or lever should stand boldly and prominently out from behind it, to a degree to give the tendinous cords affixed to it that set-off from the limb which enables one to trace them through the skin perfectly distinct—isolated as it were—from the substance of the thigh. "Bad hocks," such as want these "fair proportions," are deficient in breadth and boldness of feature, and have, in consequence of such deficiencies, a mean, gummy, unattractive aspect. When the hock, from want of boldness and projection in its point, is rounded behind, forming, in conjunction with the thigh and leg in their posterior outline, a sort of semicircle, the horse is said to be *sickle-hocked*. And when, from the breadth of the pelvis, or the inward direction given to the tibial bones, the hocks are positioned too near to each other, the hind cannons running forward and the hind toes turning outward, the horse is denominated *cow-hocked;* cows being remarkable for such conformation. The cannon, from the hock, should descend in a vertical line towards the ground; a position in which it has more extent of motion, both forward and backward, and one which gives to the hock its greatest power and efficiency in action. The longer the thigh and the more the hock "sets out" behind from the body, the greater the sphere of the action of the hind limb, though the power of the hock is weakened by the longitude of the tendons inserted into it. That is the strongest hock which, being of itself well-formed, receives the muscular substance, along with the tendinous cords, into its very substance, the two being knit closely and compactly together; or, to use the dealer's phrase, "the thighs being let down into the hocks." A horse with straight thighs will have *straight hocks;* and these, though their straightness cannot be regarded, abstractedly, but in a disadvantageous light, while they are the best or only kind which could have suited such a make of limb, may still

be good of their kind, and therefore are not to be condemned. The os calcis may be lengthy and prominent upward, and the lateral projections may stand well and clearly out from the sides, and the hock, though straight, may, as I said before, still be considered good.

Hocks, I must repeat once more before I conclude, are of that importance in action that they deserve, in our examinations, to command much attention from us. A horse may have very good hocks, and yet be so shapen in other respects as to be worth very little; but hardly any thing can compensate for bad hocks, the hock being in its operation that in progression which the oar is to the boat. Without power therein no horse can go well and long: he may possess action, but he cannot fail to prove deficient in strength and endurance.

The bones below the hock being the same in number and kind as, and similar in structure to, those below the knee, and their relations and uses being alike, there will be no need here to add anything to the descriptions already given of the cannon and splint, and pastern and sesamoid bones; and as every individual part of the machine, the foot excepted, has now been described, I shall, in the next lecture, take a review of the skeleton as an entire structure, entering more fully and practically than has been done before into the consideration of it as a machine intended for purposes of locomotion and the carriage of burthen.

LECTURE VIII.

THE PROPORTIONS OF THE HORSE.

In the construction of animal bodies Nature appears to have had two grand objects in view, utility and beauty. An all-skilful hand has so made every "living thing," that, with an exterior calculated to excite our admiration, interiorly it is furnished with every requisite for the performance of those functions for which it was created. How beautifully is this illustrated throughout the animal creation! How beautifully is it further illustrated throughout individual animal mechanism! Not an animal, not a part even of an animal, but what is made and fashioned after a manner excellent in design, inimitable in execution. In what the finite view of man regards as

beauty, no animal, man excepted, is allowed to exceed the horse: the well-known admired picture which David has drawn of him in the Psalms; the eloquent allusions Shakspeare and other writers of eminence have made to him; all attest the estimation in which these great observers of Nature held his form and qualifications; nor is "the noble horse" less admired and valued, in our country at least, at the present day.

Although beauty and utility, as regards animal bodies, on most occasions are found to go hand-in-hand, the rule is far from wanting exceptions. An individual part—the head, for example—may be small and faultlessly shaped, and yet the possessor of it, as now and then happens among human creatures, may not be highly gifted; on the other hand, a horse having a plain, even an ugly head, may possess high qualifications. Phrenologists may possibly set these facts in a different light, though as yet the practical horseman has not derived that assistance from the science of phrenology which more attention to it would probably afford him. With a view of arriving at a knowledge of that frame-work of animal machinery from which we might reckon on deriving the greatest power and speed, it was natural enough that any person engaged in such an investigation should seek for a model of a horse, and for one of that description which was known and proved to perform in the most superior manner; and having succeeded in finding such a model of perfection, it was but natural for him to set it up as a sort of prototype or standard, whereto others might be compared, and whereby their powers might be estimated. Considerations such as these appear to have prompted the first Professor of the Veterinary College, St. Bel, to set about and produce his work "ON THE GEOMETRICAL PROPORTIONS OF ECLIPSE." St. Bel's words in his "advertisement" are, "When first I employed myself in taking the proportions of Eclipse, I had no other object in view than to gratify my own curiosity with respect to the figure, extent, and direction of the parts which compose a race-horse, and to compare them with those of horses of different kinds, for the purpose of informing myself of the mechanical causes which conspire to augment the velocity of the gallop."—"Since it is true, that the construction and direction of the bony and muscular parts within determine the outward figure of the body, a table of proportions, collected from the best

race-horses, would be of great service;" and also "by means of this table, we should be enabled to establish the true conformation of the race-horse, and at any given time to discover whether the breed has improved or degenerated." That Eclipse was a race-horse of the first distinction, both for speed and bottom, no one will dispute. He won more and higher renown on the turf than any horse either before or since his day; and, therefore, St. Bel had a right to assume that his proportions were, as near as could be obtained from any one individual, such as a perfect race-horse should possess.

By the "proportions" of an animal body is meant the dimensions—the length, breadth, and thickness—of the various parts or pieces of which it is composed, in the relation that one part bears to the entire structure or to another part: for any individual part may possess in itself very correct relative dimensions, and yet be, as a component piece of an entire structure, out of proportion, or not in symmetry with other parts. The eye accustomed to view animals in regard to their make will in a moment detect any flagrant disproportion in the constituent parts of a body; and yet, were the same person asked what the proportions of the faulty piece in the structure ought to be, he could probably only answer you by a reference to the body he had been finding fault with. St. Bel, following a practice instituted by the great Bourgelat, the founder of the veterinary schools in France, was prompted by his example to carry these matters out of the mere pale of speculation, and to institute in the British school what already existed in the French, viz. a scale of perfect proportions whereto all horses might be referred, and by which they might be geometrically compared and computed. He had a right to view Eclipse, from his achievements upon the turf, as a horse, take him altogether, as near perfection as Nature in her strange and fanciful variety has made the animal; and he, therefore, adopted his admeasurements as those of the proper proportions of a race-horse. And in order that these proportions might be reduced to a scale, and so be made applicable to horses of all sizes, St. Bel, still treading in the steps of his great master, Bourgelat, first took the measure of the head of Eclipse, and by that measurement computed, in regard to length, all other parts of his body. Whether these chronicled proportions prove of any practical use to us or not, they will always serve to

represent what sort or stamp of a horse Eclipse was: a matter so difficult to determine with any exactness from any painting or print of him, knowing, as we do, that painters do not, in general, proceed in their works after any geometrical calculations.

We learn from LECOQ* that the first idea of "proportions" appears in an Italian work published in the sixteenth century; though to Bourgelat are we indebted for their establishment upon a rational basis. Following GRISONIE, Bourgelat assumed as his "unity of mensuration," the head of the animal to be measured; and this he subdivided into three parts, which he called *primes;* each prime into three *seconds;* and each second into twenty-four points; making, altogether, 216 subdivisions. Lecoq has reduced these subdivisions down to hundredths, and has submitted the following scale as that of Bourgelat, with some slight improvements, founded upon changes in the position of the head and that of the hind quarters.

The height of the horse, measured from the poll of the head to the ground, is estimated at three heads' length; from the top of the withers to the ground, at $2\frac{1}{2}$. The distance from the point of the shoulder to the point of the quarter, at $2\frac{1}{2}$ heads' length. The height from the summit of the croup to the ground at $2\frac{38}{100}$. From the summit of the withers to the point of immersion of the neck in the throat $\frac{66}{100}$. From this last-named point to the point of the shoulder $\frac{82}{100}$. From the same point to the mane, half a head's length. From the withers, in a horizontal line, to a level with the lowest point of the back $\frac{66}{100}$. From the last-named point, still in a horizontal line, to a level with the summit of the croup $\frac{66}{100}$. From the summit of the croup, extending the same horizontal line, to a level with the point of the quarter $\frac{66}{100}$. From the point of the quarter to that of the stifle $\frac{82}{100}$. From one haunch to the other in a direct line $\frac{82}{100}$. From the point of one shoulder to that of the other in a straight line $\frac{66}{100}$. The greatest breadth of the belly, in a straight line, equal to one head's length. The depth of the body, from the lowest part of the back to its greatest dip, the same. The depth from the summit of the withers to lowest dip of chest, 1 head $\frac{22}{100}$.

* Traité de l'Exterieur du Cheval et des Principaux Animaux Domestiques.

From the summit of the croup to the stifle $\frac{82}{100}$. From the stifle to the hock $\frac{82}{100}$. From the hock to the ground $\frac{82}{100}$. From the withers to the stifle 1 head $\frac{64}{100}$. From the summit of the croup to the elbow 1 head $\frac{64}{100}$.

Two questions will naturally arise in the mind here: one is, can any rules of proportion be ascertained and laid down that will prove of service to us in practice?—the other, supposing such rules can be framed with any prospect of practical advantage to us, upon what basis or determinate measures ought they to be founded? I will not offend the accomplished "judge of horses," by saying that he is likely to derive much benefit from the study of any rules of this kind, however accurate their character; but I will go so far as to give it as my opinion, that the student of veterinary medicine, or tyro in practice, might gain from attention to such rules that sort and amount of knowledge which would put him, in the course of a short time after his application of them to practice, into the possession of that knowledge which the "judge" had only been able to arrive at either through extensive and manifold observation or a lengthened course of practice. In a word, the student or beginner in such matters would, I do not hesitate to affirm, gain much ground by making that a study, so far as he could do so, which his older professional brethren had obtained but through great opportunities of experience or years of attentive observation. To give a familiar illustration of this:—a man unread in equestrian matters is not supposed to know what parts should be long or what short, in the well-formed horse, or what parts should be large, what small: he might imagine it to be an affair of little moment, whether the head were large or small, the neck long or short, or think that short arms and thighs and very long cannons were as good as the reverse conformations. But a man whose mind had been previously furnished with some notions of proper proportions could never run into these palpable errors. Theory would have taught him differently, and practice would speedily convince him of the truth or untruth of what he had learnt. So far, rules of proportion may prove serviceable: so far, and no farther, do I recommend them to attention.

As every part of the animal machine, to be in just proportion,

must not only correspond in its dimensions with the adjoining parts, but be likewise commensurate with the magnitude of the entire structure, it must be evident that we shall not be able to determine this just proportion with any thing approaching geometrical precision, unless we possess some definite measure or scale wherefrom to proceed. The French school, we have seen, took the *head* of the horse as a standard whereby all the other parts were to be measured, and whereto they were to bear certain proportions: others, however, objected to this standard, and assumed the *height* of the animal as the proper primitive measure. In either case a great difficulty presents itself, and St. Bel experienced this. "Nature has so diversified the forms of individuals," says the Professor, "that no common measure can be made to apply equally to every species."—"If each species has its own style of beauty; if even each individual has its own peculiar beauty; if it is not possible to find two horses that perfectly resemble each other, we cannot pretend to assign any one form preferably to another as the rule of beauty for the horse. Were persons the best qualified to endeavour to collect together the different beauties dispersed among the different individuals, they might, indeed, compose a model of each species sufficiently perfect to direct the painter or the statuary, but which would deceive any one who would venture to choose a horse by it for his own use." At length, however, St. Bel met this difficulty by paying no attention to what in form is called "handsome," but solely to "that mechanical construction of the animal from which result the possibility and extent of those motions by the means of which he is enabled to transport himself from one place to another with greater or less speed."—"Eclipse was never esteemed handsome; yet he was swift, and the mechanism of his frame was perfect." St. Bel had a right to come to these conclusions from the performances of Eclipse; and yet the proportions of this celebrated horse varied from those of the standard of the French school, setting up, as it were, another standard in the English college.

The French school, I repeat, regulated their scale of proportions of the horse by the measure of the head; this regulator, however, has by others been objected to; they arguing that it was more in accordance with nature to assume the *height* of the animal

as the *datum* of their calculations. It is an easy matter to prove both these methods of proceeding erroneous: the simple question seems to be, which is the least so. In one mare, for example, whose height is sixteen hands, the head measures, from poll to muzzle, twenty-nine inches; in another mare, of similar breeding and height, the length of the head is but twenty-five inches and a half, and we all know that horses of the same height may have backs long or short, legs long or short, &c. Still, as I have observed before, this is not a sufficient reason for us to cast away and despise all rules of proportion as worthless. To all general rules, there are few or many exceptions, and there certainly seem no cases in which general rules can be applied with so little success as in the form and action of animals. Even suppose we could estimate the length, and breadth, and thickness, of every part concerned in action, to the greatest exactitude, still are there other most material circumstances, such as the peculiar texture and construction of the parts, and the amount of vital energy with which the parts are endowed, that regulate in an unknown and incalculable manner the faculties and powers of action and endurance possessed by the animal.

Of all individual parts the head is that which earliest attains its dimensions, and which is the least affected by that growth of the body which depends so much upon the circumstances of food, situation, &c. At two years old the head appears to have attained its full development; and, I should say that, as there is less variation in the longitude of heads than in the heights of horses, the head, as an independent part, affords the best primitive measure we can obtain for the foundation of our scale of mensuration.

THE PROPORTIONS OF ECLIPSE.

I must confess I feel some surprise that no person since St. Bel's time—none that I am aware of—has seriously taken up this subject: at least it must be admitted to be an interesting one; one, I think, that may be turned to some useful account; and I only wish it had fallen into better hands than mine. All who feel interested in the annals of racing, and in that science which makes us, on geometrical or mechanical principles, acquainted with "the form and action" of horses, cannot fail to seek with some eagerness

what can be learnt about "the best horse that ever lived;" and every such person must feel a debt of gratitude to St. Bel for having, so far as he has, rescued the remains of Eclipse from oblivion, in having left us *data* concerning his shape and action, in number and nature sufficient to enable us at this distant day to infer what kind or description of a horse the paragon of racers must have been.

In St. Bel's "Table of the Geometrical Proportions of Eclipse," the head is "divided into twenty-two equal parts," and thus divided it becomes "the common measure for every part of the body." Aware, however, of the fallacy of this standard, St. Bel adds, "If the head appears too long or too short in a horse, that common measure must be abandoned, and the height of the body taken from the top of the withers to the ground." Lecoq finds the same difficulty, and instructs us in such a case to assume as the "unity of mensuration," two-fifths either of the height or of the length of the body; from which it would appear that the head is to be presumed to be of its proper longitude, when two lengths and a half constitute the measure of either the height or the length of the body of the animal.

We are told by St. Bel, that Eclipse measured 66 inches—16½ hands—in height; and that he stood higher by an inch behind than before; and that this great height was still exceeded by the length of his body, that being three inches more, or sixty-nine inches. It is but rarely that we behold a horse of these dimensions, even among the big Derby colts of the present day; and when we come to add fair proportion and power and energy to this gigantic frame, we shall not feel so much surprise at his wonderful exploits. What appears most remarkable, however, in the "proportions" of this famous horse, is the smallness or shortness of his *head*, it measuring, according to calculations readily deducible from St. Bel's mensuration, but twenty-two inches; a circumstance, seemingly, that gave rise to his subdivision of it into twenty-two parts, each part then being equivalent to one inch. Hence Eclipse's height being sixty-six inches, was equal to three heads' length, exceeding that of the scale or regular-proportioned horse by half-a-head; and the same excess, and three inches added to it, occurs in his length: circumstances mostly, I repeat, attributable to the smallness of his head. Eclipse,

consequently, was a tall horse and a long horse, a horse higher behind than before, and, withal, a horse possessing a very small head.

Either, therefore, there is something fundamentally erroneous in the standard of the French schools, or else Eclipse must have been, in his head or other parts, out of proportion. Considering that he stood sixteen and a half hands high, and that his head measured no more than twenty-two inches, we need feel no surprise that, while other horses, according to the scale, were but three heads' length in height, he measured three and a half heads. I say this will account for his apparent out-of-proportioned tallness, but it will not account for his neck measuring thirty-three inches, or being equal to one and a half head's length. The regular proportion of the length of the neck being one head, we can in nowise account for the eleven inches in excess by supposing that the head was two or three or even four inches shorter than heads in general; and therefore the inevitable deduction is that Eclipse had a long neck, certainly a most desirable formation in a race-horse. His neck, as well as being *long*, was likewise well-proportioned; for it measured in width twenty-two inches at its junction with the shoulders, and yet was but a foot across at its union with the head, shewing how beautifully it must have tapered upward: whether it was of the *rainbow* shape, or was *straight*, is not quite evident.

The head of Eclipse must have partaken a good deal of the Arabian character; and no wonder, since, on the side of his dam, he is only the sixth remove from the pure Arabian: his dam being got by Regulus; his grandam by a full brother to Wildman's Squirrel; his great grandam by Lord Darcey's Montague; his great great grandam by Hautboy; his great, great, great grandam by Brimmer, son of the Oglethorp Arabian.

*Below** the eyes, St. Bel informs us, it measured, across, one foot; but from one eye to the other only seven inches; shewing that along with this extraordinary breadth of forehead his eyes were well placed, towards the centre of his head: points not only of utility, but of beauty likewise.

The breadth of the lower or posterior part of the neck (twenty-

* This must be an error. The measure must have been taken *above* the eyes, from one orbital arch to the opposite.

two inches), with the measure of the scapula, eighteen inches, and the largeness of the chest, are circumstances sufficient for us to come to the conclusion that Eclipse possessed *some depth of shoulder;* it was likewise *oblique,* for its angle of inclination amounted to 70°: in fact, all the fault St. Bel could find with the shoulder appears to have been, that it was "too much loaded;" a fault, if fault it be, that certainly denotes strength, and one which, I feel no doubt, many racing people would prefer to "a fine shoulder."

Eclipse's body measured, across its middle, twenty-six inches in depth, and the same in breadth; consequently he must have possessed "a circular barrel;" and his girth, around the *middle* of his body, at least, must have been—taking twenty-six inches for the diameter of the circle — seventy-eight inches; a circumstance which, unless we take it to have been that of the bare bones, or of a horse drawn or fallen away, certainly presents nothing extraordinary. There must have been a remarkable squareness about the body of Eclipse, inasmuch as lines running transversely from the withers to the stifle, and from the summit of the rump to the elbow, proved of equal lengths. What his actual girth was does not appear; but, according to the depth of his shoulders, it is evident he must have been deep in his chest, or let down in his brisket; and that his circularity of chest did not prevail in the fore parts, so as to throw his fore limbs wide apart, is certain, from the measurement of the interval between his arms being no more than seven inches.

The dip in Eclipse's back does not appear to have exceeded much two inches; it might, according to St. Bel's account, have been three inches; so that he could not have been a horse that "rose" much in his withers: his height was sixty-six inches, and he measured two heads and twenty parts, or sixty-four inches, in the middle of his back, just posterior to the place of dip; for which I allow (too much, perhaps) an inch, making the amount of dip, as I said before, at the very utmost, three inches. From the place of dip, the line of his back inclined (in a curve) upwards, rising at the summit-point of his quarters to one inch higher than he rose at the withers, from which it very gradually declined, but not with much incurvation, if any, to the tail. Eclipse, therefore,

had a back roached rather towards the loins, but *straight* quarters, and, as we shall find, also *lengthy* quarters.

What we have to admire, as much, perhaps, as any points in Eclipse, is the length and breadth of his arms and thighs: he being, in the fullest sense of the words, a large-limbed horse. His arm measured, across, from the front to the point of the elbow, the surprising breadth of ten inches, and was longer by two inches than, according to the length of the entire limb, it is in horses in general; the measurement, by the scale, being equal between the elbow and bend of the knee, and the latter and the ground: immediately above the knee the arm measured five inches across, shewing that it preserved its great breadth all the way down.

For the relative lengths of the different parts of the fore limb, we must content ourselves with St. Bel's measurements of the bones. The radius was sixteen inches long, the cannon-bone twelve inches; the pastern, coronet, and coffin-bones, together, seven inches in length: from all which it seems, according to the measurement of other horses, we may infer that Eclipse had, with his long and broad arms, short cannons, and by no means lengthy pasterns.

There must have existed considerable harmony of proportion, and consequently beauty of form, in Eclipse's hind quarters. A line extended from the summit of his rump proved the measure of another passing from the root of the tail to the stifle, to a second drawn between the latter point and the hock, and to a third from the hock to the toe of the hoof. The breadth of the thigh, "taken below the fold of the buttock," was great, ten inches; the same as the arm across at the elbow. Likewise there was great extension between the point of the hock and the bend of the ham, the measure being eight inches; shewing Eclipse must have been the possessor of extraordinarily broad or good hocks, a point of the very first importance in a racer. The cannons and pasterns measured, as is always the case, longer in the hind than in the fore limbs.

Eclipse's limbs were not only large, but long: he must have been what is called a "long-legged" horse; for St. Bel tells us, he measured forty-one inches from his elbow to the ground; leaving but twenty-five inches—his height being sixty-six—in a perpendicular line to the top of the withers; and as the general rule

is, that horses should measure equal lengths from the fetlock to the elbow, and from the latter to the withers, if we subtract the length of the pasterns and foot, altogether, say nine or ten inches, or even a foot, we shall still have an excess of length of limb. After we have been told, however, that his chest measured twenty-six inches in diameter, there appears something rather irreconcileable with the statement that from the withers to the elbow is but twenty-five inches. It is not my desire to impugn St. Bel's "table," though I must say that in this, and one or two places besides, there appears some discordance in his admeasurements.

We may, however, I think, safely receive as matter of fact the following summary:—

Eclipse was "a big horse" in every sense of the words: he was tall in stature, lengthy and capacious in his body, and large in his limbs. For a big horse, his head was small, and partook of the Arabian character. His neck was unusually long. His shoulder was strong, sufficiently oblique, and, though not remarkable for, not deficient in depth. His chest was circular. He rose very little in his withers, being higher behind than before. His back was lengthy, and over the loins roached. His quarters were straight, square, and extended. His limbs were lengthy and broad, and his joints large: in particular his arms and thighs were long and muscular, and his knees and hocks broad and well-formed.

That which, however, constituted, in St. Bel's eye, "the most beautiful and important quality of his structure" was the perpendicular lines drawn through his fore and hind limbs: indeed, so perfect were they, that "they may serve," adds St. Bel, "as rules in the choice of the best racers."

THE FIRST PERPENDICULAR falls from (what we call "the point of the shoulder") the articulation of the humerus with the scapula, precisely upon the front of the toe.

THE SECOND falls from the upper part of the fore-arm or elbow to the heel of the fore foot, dividing in its course, longitudinally, the fore-arm, knee, and cannon.

St. Bel's third perpendicular is but a part of his second; and his fourth drops equidistant between the fore limbs. We, therefore, shall pass to

THE FIFTH, which falling from the point of the stifle, according

to the regular scale, should come in contact with the toe of the hind foot, but in Eclipse struck the ground *half-a-head's length* (eleven inches) *in front of the hoof*.

THE SIXTH descends from the point of the hock, along the tendon of the hind leg, and, touching the heel of the fetlock, falls to the ground behind the heel of the hoof.

THE SEVENTH falls equidistant between the hind legs.

THE EIGHTH AND NINTH have reference to the body. One falls from the withers to the ground, touching the point of the elbow in its descent; the other from the middle of the back, through the body, to the central point of the quadrilateral figure described by the position of the four legs.

All these perpendiculars proved true in Eclipse; one alone differed from those of the approved scale, and this difference, we shall find, was attended with advantage: indeed, Eclipse's formation in this respect would appear to have corrected a grand error in the geometrical figure of the French schools.

In describing the differences between the proportions of Eclipse and those of the table of the French schools (which he reckoned to be five, viz. extraordinary height, both of head and body; extraordinary length of neck; the perpendicular from the stifle; and the greater length of arm) St. Bel omitted a very important difference, deducible from his own statements, which is, extraordinary length of limbs compared with the depth of body. St. Bel's admeasurements, as far as they go, have no doubt enabled us to make out what sort of a horse Eclipse was; but his mensuration might, in such a case as this, with much advantage have been carried a great deal farther—might, for example, in the instance of the limbs, included the circumferences of different sections, and, in many other parts, their relative span or thicknesses—also due allowances ought to have been made for the age and condition of his subject. He tells us, he "took the proportions of Eclipse while living, and satisfied his curiosity after his death upon his skeleton, by dissecting his body himself."

It may not be out of place, or unacceptable, to conclude this account of our prodigy of horse-flesh with the remarks, that Eclipse lived to the age of twenty-six, and died of "a violent cholic," on the 27th of February, 1789, at 7 o'clock, P. M.; and that, after a

very minute post-mortem examination, St. Bel came to the conclusion that his death was owing to disease of the kidneys, combined with "violent inflammation of the bowels;" and found that his heart weighed fourteen pounds*.

LECTURE IX.

ACTION.

Properly speaking, the phrase *locomotion* denotes the faculty an animal possesses of transporting his body or moving himself from place to place; the term *action* expressing his mode or manner of doing this. No horse, in his healthy or normal state, is without the power of locomotion; though there are only certain horses that, in the estimation of the connoisseur, possess action. Action, however, is not infrequently used in a *generic* sense, being then synonymous with locomotion; the kind of action being expressed by such epithets as *good, bad, high, low, round, darting,* &c., and this is the sense in which I purpose employing it on the present occasion.

For the performance of action or locomotion, two sets of structures are needful: one, which is passive, *the bones,* I have already had under consideration; the other, the active power, *the muscles,* I shall now consider.

THE MUSCLES.

The flesh investing the osseous fabric of an animal body proves, on dissection, divisible into numerous distinct pieces or portions, various in shape and magnitude, and so disposed that, through a power every portion, independently, possesses of contracting or shortening its length, the bones by them are flexed or extended one on the other, according as is required for the purposes of action or locomotion. That inimitable piece of mechanism, the skeleton, is, as we have already seen, so constructed as to admit of the bones,

* Notwithstanding this—as it appears it must have—including the blood the heart contained, still the weight must be regarded as enormous.

through the means of their joints, moving upon each other, to that extent and in that direction, which is needed for the action of the parts; and the muscles or acting powers superadded to it, are so applied and distributed upon it, that, while they are enabled to move every part in the manner it was designed to move, they, so far from encumbering or disfiguring the frame-work, confer upon it beauty of form and handsome exterior. It is true that the muscles might have been placed greatly more to their advantage as moving powers; but in such case not only must outward appearances have been sacrificed, but the form of the animal would have turned out such as would have materially interfered with his present functions and uses: thus what he had gained in power he would have more than lost in inaptitude and encumbrance.

The bones, in their figure and in the construction of their joints, offer every facility compatible with the general form of the animal, to the agency of the muscles, the power of the latter depending upon that facility, which is greater in some subjects than in others, and upon their own magnitude and texture. The principle upon which movement is effected is that of the mechanical power of the lever—the greater the leverage presented by the bones, the greater the effect of the action of the muscle upon it; and as muscles, generally speaking, possess power commensurate with their size, the larger the muscle the greater its power of contraction or action. These are the two leading principles on which depend the powers or strength of an animal; there is a third, also to be taken into consideration, which is the texture of the muscle, the quality of its fibre or component parts. That horse whose bones are so formed and arranged as to offer the longest or most advantageous levers, will, *cæteris paribus*, prove the strongest or most powerful: supposing, however, his muscles to be deficient in power, from wanting bulk, or from being lax or adulterated in composition, his length of lever will prove of little profit to him. The same may be said in cases where the muscles are powerful, but the leverage short or upright, and consequently disadvantageous.

In the course of our investigation into the quality of bone in horses of different breeds or kinds, we detected a manifold difference between the solidity and texture of the bone of the cart-horse and that of the race-horse; and if we prosecute our inquiries still

further, we shall find some such difference existing between the muscular fibre of the high and that of the low bred animal. In proportion as the fibres of flesh run fine and free from adulteration of adipose and cellular tissue, so are they apt and powerful in action. The heart is one of the finest and cleanest muscles in the body, being required to act with promptness, energy, and duration; and for the same reasons blood-horses are constituted of finer and cleaner muscular fibre than cart and mongrel-bred horses.

Independently, however, of original constitution, muscular fibres will be large and clean and fit for action according to the exercise or work they may have been in the habit of performing for some considerable time past. When we hear it said that one horse (of the same breed) is "in condition," and another "not," we may take it for granted that the muscles of the one have, through a course of exercise and labour, called training, been got into that state of perfection wherein they are capable of performing double or treble what they could have done in a state of idleness or comparative inactivity; and hence it is that by all connoisseurs in horseflesh so much importance is ever laid upon *condition*. The same horse *in condition* and *out of condition* might be, without much hyperbole, pronounced to be quite a different species of animal; for not the muscles only, but the bones, and no doubt other parts as well, under such totally opposite circumstances, undergo, in the course of time, very material alterations in their composition. Indeed, to minute differences of texture existing between the organs of locomotion in animals of high and low breeding—taking into our account the amount of nervous energy either respectively possess—would appear to be mainly attributable those differences of action and capability so characteristic of the two breeds. The race-horse and cart-horse have the same number and shape of bones and muscles, the same locomotive apparatus, in fact, both as regards framework, jointing, arrangement, and distribution; and yet nobody expects the cart-horse to run a race, or the race-horse to go to plough or drag a brewer's dray. St. Bel took up this interesting question, and considered the explanation of it to reside in the respective *weights* of the animals and in the "mechanical arrangement" of the locomotive organs. His words are, "How different is the gallop of the large dray-horse from that of the race-horse! It

is with difficulty that the former moves his body to determine it into the place required. He gathers the ground heavily under him at each step, and the translation of his bulk is but tardily effected. The latter, on the contary, flies like an arrow from a bow, and scarcely imprints the ground with his shoe; often running over a space of four miles in less than eight minutes. These are, however, but individuals of the same class. The number of parts which conspire to effect their respective progression is the same in each; *but these parts differ in their bulk, their extent, and their direction;* from whence result different degrees of power in the levers which they form. So that we are not to imagine that the mass or weight is the only cause of his slowness, *which rather proceeds from mechanical arrangement of the parts,* whose relation and correspondence determine the extent of his motions." No doubt, allowances must be made for "the mass or weight" of the cart-horse as compared with the blood-horse: it is not so much, however, the dead weight of their bodies as it is the *bulk* of their frames—that which is spread out in the one being condensed and consolidated in the other, without any material loss of power or strength. A reduction of the bulk of parts, renders them not only actually lighter but fitter for conveyance through the air at a quick rate; and when this is effected with increased advantages of lever and facilities for motion, speed must result: the loss of strength not being commensurate with the gain of speed. What, however, as I said before, has as much or more to do with enhancing the animal's powers of speed and endurance than either his diminished bulk on any notable differences in the "mechanical arrangement" of parts, is the *difference of texture* between one and the other, combined with the endowment of a higher amount of nervous energy: for, regard the differences of structure or texture as we may, they are still of themselves insufficient to account for those excellencies which are comprehended in the phrase "blood" or "breeding"; and which we well know from experience will carry the animal through his labours when every thing else would fail. Vital or nervous endowment, mysterious and incapable of physical demonstration as it may be to us, must, therefore, ever be taken into the account of feats of action and endurance: and when large horses possess this fineness of fibre, together with the requisite nervous energy, we

know they will "beat" all little horses. Eclipse was, altogether, a stupendous horse; and with his powers and breeding combined, no competitor could live with him. The reason why, in general, little horses are better than big ones is, that they inherit a concentration of power and energy which the larger sort seldom possess: the moment, however, a breed of *good* large horses is discovered, the little sort cannot fail to fall into the background.

When we reflect on the quick and varied motion of which an animal body is susceptible,—the number of parts there are to be moved, and that every muscle or moving power necessarily has its antagonist muscle or power, we shall not feel so much surprise at learning that there are upwards of three hundred muscles distributed over the body and limbs, and that these vary almost in every possible degree in magnitude, and are of an endless variety of shape or figure. Being mostly for the purpose of locomotion, the majority and the largest of them run from the body to the limbs; and the hind limbs, from having a great deal more to perform than the fore, possess the largest and thickest masses of muscle. The parts called the *buttocks* or *quarters* being composed of muscles whose office it is to propel the animal onward in progression, necessarily possess great fleshiness and bulkiness. The fore limbs are slender compared with the hind, they having little more to perform than to support or sustain the fore half of the body, and head and neck, and not to do much work in progression. I said before, and I repeat here, that as muscles are worked or exercised, so do they become large or powerful; and this, independently of original formation, will go far to account for their increased size in the hind as compared with the fore quarters, as well as for their largeness or plumpness in animals in condition, and for their smallness or flabbiness in such as are out of condition. View the race-horse brought to the starting post in condition to run; mark his beautiful satiny skin, elevated into prominences by the muscles underneath, which appear distinct enough through it almost to admit of anatomical demonstration: then *feel* his muscles, grasp his crest and shake his neck, and mark how firm and hard his flesh is, and how whipcordy and clean his sinews have through training become; in fine, what a totally different creature he is from what he was before being put into condition to race.

THE STRUCTURE OF MUSCLES is *fibrous*. So many packets of fleshy fibres, constituting in reality so many lesser muscles, disposed in parallel lines, and united together into one mass of flesh, form a distinct and separate muscle. But these packets are divisible into smaller packets, and these again are resolvable into fibres of a still smaller description; and of what the ultimate or primitive fibres consist, or what their true nature may be, microscopical observers are hardly yet agreed, some contending that they are *tubular*, others that they are *beaded* filaments. Be which or what they may, during life they possess the power of contracting or shortening themselves; and through this vital property of contraction it is that all the motions and movements of the body are effected. The order or stimulus for muscular contraction is given by the brain, and conveyed to them through the medium of the nerves; and the action proves feeble or forcible, according to the nature of the order or the amount of nervous energy emitted into the muscle. What muscular contraction is, how the phenomenon is effected, remains, after a host of minute and searching inquiries, still problematic: we know little more about it than that it is present with life and absent in death, and that, therefore, it is not dependent on elasticity or any abstract physical force.

THE TENDONS or *sinews* with which most muscles are provided, and which are different altogether in their appearance (being white) and their texture from the muscles themselves, possess no power of contraction, neither are they elastic: they can neither shorten nor elongate. They are, in fact, simple cords connecting the muscles with such parts as they are designed to put in motion, and, being so much smaller than the muscles themselves, are on that account capable of being intruded into the composition of parts, without adding inconveniently to their bulk, or destroying their symmetry. Through the intervention of tendon, for example, muscles situated in the arm flex and extend the foot. Had there been no tendon or sinew, the fleshy parts of the muscles must have been continued to the foot, thereby rendering the leg an awkward-shaped appendage, as large round, or nearly so, as the arm itself. The "back sinews," as the flexor tendons are commonly called, are stout firm cords attaching the flexor muscles—forming the posterior part of the arm—to the pasterns and foot. The more promi-

nent and perceptible they are to the grasp of the finger and thumb, the "better" in kind we reckon them to be; and it is, perhaps, as good a criterion of their quality as we can have, that they "stand out well" from the cannon bone, feel tense, and hard, and clean, and perceptibly distinct from another cord, between them and the bone, *the suspensory ligament*, and that the leg altogether, below the knee, measures much in breadth and much in circumference.

MUSCULAR MOTION.

THE property possessed by an animal body of locomotion—self-movement—is of a nature altogether different from any we witness in machinery: how ingenious soever a piece of mechanism may be, and imitative of the movements of the vital machine, there is still this essential difference between them—that one moves through an extrinsic force or power communicated to it; whereas, in the other, the power of motion is created or generated. It is, in the strictest sense of the words, a self-moving machine, the other being but self-moved: and in the muscles reside the source of motion. They, during life, possess power of *contracting* or shortening their lengths, through which simple change all the movements of the body are brought about. What it is that enables them to contract, what alterations of structure or arrangement they undergo during contraction, is a question that has puzzled those who have made themselves best acquainted with their intimate texture and organization. We must, therefore, content ourselves with a knowledge of the established facts, that the self-moving power resides in the muscles, and is dependent on their vitality; dead muscle, or flesh, being devoid of any such property.

The contraction of a muscle has the effect of bringing nearer together the parts to which its ends or extremities are attached; either both attachments move in approximation, or, one being fixed, the other moves towards it. The tail, e. g. (which is a good exemplification of muscular action), is raised by the contraction of muscles running from the croup to its upper surface, called, from their office, the *erectores coccygis;* and is depressed by muscles running underneath, from within the pelvis to its under surface,

named the *depressores coccygis*. There are likewise two other muscles, one on each side, having the power of curving or flexing the tail around the quarter, either to the right or left side, according as the right or left muscle is in action. Altogether there are eight—four pairs of—muscles belonging to the tail: two for raising it, two for depressing it, two for forcibly compressing it against the rump, and two for curving it either on one side or the other. Less than eight muscles would have proved insufficient for the various movements of which the tail is capable, and with the eight, admirably arranged as they are, the tail may be made to perform movements in any radial direction of a circle; and, indeed, by the alternate action of them, to describe a sort of circular motion, such as we every now and then perceive when the horse is switching off flies, or making efforts to rid himself of any source of annoyance or irritation.

In the ordinary or natural manner in which a horse carries his tail, the action of the muscles may be said to be nicely balanced; none are forcibly contracted—none completely relaxed—all are in that semi-contracted, semi-relaxed condition, which, by physiologists, is characterized as their *tone:* and this tone is said to be *good* or *bad* according as, from previous exercise and other circumstances, they are in a condition to do much or little work. While a horse is going, the coccygeal muscles participating in the general action of the body, the tail becomes partially erect; but, while in the stable, every muscle ceasing to act, it droops from its own weight, and lies at rest against the quarters: and this is, in truth, the only *real* relaxation or repose these muscles experience; for, while the erectors are elevating the tail, the depressors are not passively relaxed, but, like hands employed in moderating extension, lest the part be over-stretched, are engaged in keeping up a proper degree of counter-extension. The operation of nicking plainly elucidates the effects of muscular action: the depressor muscles of the tail being severed, the erectors, every time the horse is set in action, elevate the tail to the uttermost, and maintain it thus preternaturally erected, there being no controlling powers to moderate the elevation.

Another effect of muscular contraction well exemplified by the tail, is, the prodigious force muscles are capable of exerting. All

practical horsemen full well know, that, to raise the tail of a strong-docked horse, requires often more than the strength of the strongest man's arm. Horse-dealers and grooms, indeed, and connoisseurs in horses, often take the strength of the dock (of the tail) as an estimate of the *general* muscular powers of the animal; and the criterion is one by no means to be despised, it being but reasonable to infer that great strength in one part would not be unattended with correspondent power in others.

The limbs of the horse furnish us with beautiful illustrations of the force and velocity, extent and variety, of muscular motion. In the fore-limb no less than thirty muscles are employed; eighteen being occupied in the movements of the shoulder and arm, the remaining twelve with those of the leg and foot. When speaking of the bones composing these parts, I said that between the shoulders the fore-quarters of the body were in a manner suspended through the medium of attaching muscles. There is one muscle especially designed for the performance of this function—*the serratus magnus*—a muscle of vast magnitude and power, which, though by anatomists regarded but as one, might with just reason, by the physiologist, be described as many; inasmuch as by such a supposition alone can he account for its unwearied discharge of the laborious duties assigned it. Its twelve distinct origins from the cervical vertebræ and ribs ought to be considered as twelve distinct portions of it; some of which are in continual action, while the others are recruiting their tone by repose. Another important duty performed by this muscle, and one in which it is probable most if not all of its divisions are engaged, is that of, during the action of the fore-limbs, fixing the central part of the scapula to the ribs while its upper and lower ends revolve, in segments of circles, backwards and forwards; the other muscles attaching the scapula to the trunk being employed in effecting the revolving movements.

With the exception of the joint at the shoulder, between the scapula and humerus, the joints of the fore-limb are so constructed that they can hardly be said to admit of any motions beyond those of flexion and extension; and therefore a very proper division of the muscles moving them has been made into *flexors* and *extensors*. It might be imagined that one or two of each sort would be all that was required for such simple movements; when, however, it is

considered that the knee-joint admits of some trifling lateral motion, and that through it some variety is given in progression to the direction of the leg, it will be seen that more became necessary to give steadiness and precision, as well as due force and effect, in action. The flexor muscles are more numerous and powerful than the extensors, because all action in the fore-legs consists in flexion: during extension the animal is standing still. There is an important extensile movement in the arm performed by *the extensor brachii*, whose point of insertion is the process we call *the elbow*, and which, in the living animal, is recognized by the remarkable plumpness of flesh immediately above that process, and before the girthing-place. Every "judge" of horses knows that prominence at this part constitutes an excellent "point;" it being of the very first consequence that the arm should be extended with force, and be firmly maintained in this extension, both on account of the projection of the limb in action, and for sure and safe alighting and standing upon it. When the horse is throwing his fore-legs straight out in the gallop, or projecting them, *dart-like*, in the trot, this is the muscle which, as far as the arm is concerned, is chiefly employed; therefore strength of action, if not extent of projecture, will mainly depend upon its magnitude or efficiency.

The muscles designed for the motions of the leg and foot are situated upon the arm—in the hind extremity upon the thigh; there being, as I before observed, no muscle or flesh, but tendon or sinew alone, below the knee and hock; and these muscles are inserted into the uppermost part of the leg, as close as possible to the centre of motion—the knee or the hock. Considering the length of the lever from either of these parts to the extremity of the hoof, it will at once appear to what a great disadvantage these muscles are acting; when we come, however, to reflect, that the tendons could not have proceeded in the straight or direct line to the foot, on account of the infraction upon the form of the limb, and that by the present admirable arrangement, though power be lost, velocity of movement is gained, and gained in a manner to compensate even for that loss of power, we shall discover that an all-wise hand has in the construction of these parts not only overcome every difficulty, but at once accomplished every desirable object. For every half inch of contraction of the muscle, and

corresponding half inch of space through which the leg revolves at the knee, the hoof at the extremity of the lever will move through a space equal in extent to as many feet, and the velocity of motion being augmented in increasing proportion, it is evident that the force with which the foot strikes the ground must be greater even than if the muscles had been prolonged and attached to the foot itself. The increased weight of the horse-shoe at the very extremity of this lever will, when once set in motion, by adding to the momentum, like the weight upon the fly-wheel, augment still more this force; though, of course, it will require greater exertion in the muscles, and so tend to tire the animal all the sooner. Short cannons, in reference to muscular action, are, therefore, preferable to long ones, because their leverage is less, and because with long arms there is greater length and strength of muscle; though it will be seen, from what has been said, that, in a mechanical point of view, they are not calculated to move with the same degree of velocity as long ones*.

The muscles of the back, loins, and haunches, are remarkable for their size and power, and for the important parts they perform in progression. It has been before observed, that, for strength, the loins should be "broad and rounded, the haunches fleshy, and the thighs let down to the hocks†;" all which amounts to nothing more than saying, that the muscles constituting these parts should be large and powerful, it being quite impossible that a horse of slender muscularity in these—the most important of all—parts, in proportion, can either "go," or "maintain the pace" as a hunter or racer; the loins being the parts from which, when the hind feet have been projected forward and placed to serve as *fulcra* upon the ground, the spring is made which impels the whole machine onward, and the haunches being the chief agents in the propulsion. In racers, as has been observed on a former occasion, the loins and hind quarters are considered as of paramount importance; in greyhounds, in the deer species, in hares, rabbits, &c., in fine, in all quadrupeds of speed, the same conformation is remarkably characteristic; plainly

* See what has been said about long and short arms and cannons in the description of the bones.

† In Lecture I.

shewing whereabouts the power for fast and efficient galloping should be lodged.

Although we are unable to account for the production of muscular motion, the principles directing its agency on the framework of the skeleton are clearly those of mechanics; the lever being the power according to the laws of which locomotion may be said to be effected. The bones constitute "a series of levers," on which the muscles operate with more or less advantage and effect, depending upon their length, their position, their prominences or processes, &c. Of levers we know there are three kinds; and of each of them examples may be found in the animal economy.

For instance, the extension of the fore-limb is effected on the principle of that description of lever in which the *fulcrum*, or axis, or centre of motion, is situated between the moving power and the resistance or part to be moved; whereas, in the flexion of the limbs, both fore and hind, in general, the power holds the intermediate place. When the arm is extended, the elbow-joint becomes the *fulcrum;* the point of the elbow, to which the muscles are attached, the *power;* and the limb itself the *weight* or *resistance.* When the arm is flexed, the elbow-joint is still the fulcrum, but the power is now transferred to the radius, the resistance being the same: thus furnishing us with an example of a lever of another kind, one in which the power is intermediately placed. A third kind of lever is exemplified in the extension of the hock, the foot being upon the ground: the foot now becoming the fulcrum, the point of the hock the seat of the power, and the resistance or weight to be moved forward, falling down the shaft of the tibia, operating upon the hock-joint. The same lever appears in the extension of the fetlock after it has been flexed in action for the purpose of pointing and fixing the toe in the ground, which then becomes the fulcrum, the power being exerted at the summit of the sesamoids, and the resistance bearing upon the large pastern. These laborious duties in the work of progression which the hind fetlocks, in concert with the hocks, have to perform, acccount for their failure in horses doing much heavy draught, or that have hunted or raced much in heavy grounds.

It being a law in mechanics, that any deviation of the direction of the power from a perpendicular line to the arm of the lever is

attended with a corresponding decrease of force, and that the nearer the power approaches to the parallel line with the lever the weaker its effect, so much of the force being consumed in efforts either to drag the lever against the fulcrum or force it off, it will at once appear evident at what a great disadvantage or sacrifice of power the muscles of the limbs, from their parallelism with the bones, are in general acting. This disadvantage, however, as I said before, is greatly compensated for by the velocity acquired by the length of the resisting arm of the lever, and the comparative shortness of that to which the power is affixed. Where power, however, is wanted, as in the hock and fetlock joints of the hind extremity, although celerity of motion is still preserved by the distance at which the fulcrum is removed from the power, the requisite force is gained by the proximity of the latter to the resistance. We now perceive the advantages derived from length of hock and length of elbow, and from broad or prominent fetlocks; we may also calculate to how much greater effect the muscles in the haunches and shoulders will act, where the bones are placed at right angles nearly to each other, and when, consequently, the power of the lever operates perpendicularly to its arm. In the case of the flexor muscles of the arm playing over the head of the humerus, and that of the extensors of the thigh playing upon the patella, pulleys are established, which, though of a nature too simple in themselves to afford any advantage as pulleys, yet increase the power of the muscles attached to them by giving a more advantageous direction to the power over the resisting arm of the lever. These beautiful contrivances are likewise attended with the convenience of permitting the muscles from which the power originates being placed out of the direct line of action, in situations where they accord with the contour and proportions of the limb.

LECTURE X.

THE ACT OF STANDING.

It might appear that the quadruped, with his four legs as props of support, was sustained *mechanically* in the standing posture, after the manner of a four-legged stool or form; and, nicely poised as his body is between them, and advantageously placed as the legs evidently are for its support, at first sight the animal structure is not unlikely to impart a notion of the kind. As anatomists, however, we know that the limbs, from the circumstance of their being made with joints in them would, were they not themselves sustained by some superadded power, bend and give way under the superincumbent weight, and let the body down; we know also that the faculty they possess of supporting the body is essentially a *vital* one, the dead animal losing the property of standing. It is from the operation of the living muscles on the bones that the animal derives the power of standing, as well as of moving; therefore it is that, when we speak of "the *act* of standing," we are correctly expressing ourselves, it being in a physiological point of view as much an act as walking, or trotting, or galloping is. Each limb is kept in a state of extension underneath the body by muscles, either themselves constituting part of it, or running from the body to be inserted into it; and though their actions or contractions come greatly short of what would be required for producing motion, still there can be no entire cessation of them without the animal falling. Some horses take their rest standing—never lie down. In these the muscles sustaining the limbs must be in continual action; and on this account it seems to me that such horses can never profoundly sleep, for if they did they would fall, the same as we see horses with lethargic affections occasionally doing. I have seen lethargic horses repeatedly fall from sleeping standing, even while they have been in harness. From which it would appear that a degree of consciousness is required even to sustain the standing posture; and, therefore, it is, I repeat, that it seems to me that horses who never lie down, although they may, and apparently do, sufficiently take their rest, yet never can sleep soundly or perfectly.

The act we have been considering I shall denominate *the standing posture*, to distinguish it from two other acts of standing, one of which I shall call *the natural standing position*, the other *the artificial standing position.*

THE STANDING POSTURE is that into which the horse throws himself for ease or repose, and in which one of the limbs continues in a state of flexion or absolute rest, and this almost invariably a hind one, while the remaining three are maintained in a state of extension; the fore legs being commonly sloped backward, as when the horse is said to be "standing over," that being the position—and not the perpendicular one—which to them appears to confer the greatest ease. In some rare instances horses—such as are "stilty before"—will stand with their fore legs advanced or stretched forward underneath them. It is by no means uncommon to find horses (that are not lame) standing, from habit, with one fore leg advanced in this manner, while the other is receded rather; and when this is done it is always the hind leg of the opposite side that is flexed; the animal from time to time reversing this position of his limbs, unless it be that his foot is pointed from pain or uneasiness, and then the same leg is kept in advance. So, under ordinary circumstances, first one hind limb is thrown into flexion, then the other, and in this manner are both recruited by rest: the fore limbs obtaining their repose, standing, by being carried backward out of the perpendicular, and by the dependency of the head and neck, which brings the scapulæ more upright, and throws all the weight possible upon the posterior parts of the leg where the elastic supporters are placed. When we were examining the fetlock joint, we found that the sesamoid bones supported a proportion of the superincumbent weight, and that this proportion was greater or less, depending on the construction of this joint and of the pasterns: we now find that it will be greater when the animal is standing over at rest than when his limbs are placed perpendicularly under him; and this is the reason of his placing himself in this posture. In this position the *suspensory ligaments* will be called into greater action, and consequently there will be a less demand for muscular force. The dependent position of the head shews the same thing: the muscles of the neck having to sustain the weight of it at the end of a long lever, become in a great measure re-

lieved of their burthen by the calling into action, through the elongation of the neck, of the elastic cords running from the withers to the poll. In the standing posture, therefore, Nature prompts the animal to ease himself as much as he can by imposing more burthen upon the ligamentous powers and less upon the muscular; and these last, moreover, experience occasional relief by alternation of their states from extension to flexion, from contraction to relaxation.

The posture of repose—that which the wearied horse instinctively assumes when left to himself—is to be distinguished from any attitude into which he may throw himself in a state of watchfulness, or excitement, or alarm; and this again is different from any artificial or unnatural position in which he may be placed by riding-masters or horse-dealers, or in which he may have been taught to place himself. The instant the animal's attention becomes attracted, the same instant may he be said to rouse himself from his dormant or listless repose, and assume more or less animation, simultaneously changing the standing posture for the natural standing position: beyond this, through the interference of art, the position may be changed again to what we call the artificial standing; and thus the three acts of standing become exemplified in the same individual. The riding-master teaches the horse to "stand upon all four of his legs," in order to be ready, at a moment's notice, to spring from the standing position into any movement or pace required of him; the horse-dealer teaches the animal to stand with his fore and hind limbs stretched out in such manner as to "make the most of himself" before a purchaser; and it is pleasing to behold with what sagacity horses who have been long or frequently in dealers' hands will acquire this artificial standing; equally so is it to see how military horses ranged in their ranks will stand on the *qui vive*, ready for a brisk and sudden movement at the sound of the trumpet.

THE ACTS OF REARING AND KICKING.

Though the limbs are the transporting agents of the body, it is not mere motion of them that will effect progression, much less motion of any one or two, or even three of them, without the other, that will produce it: all must move, and in moving change

places, otherwise the animal will remain in the same situation. The movements in progression are for the most part the result of the *alternate* action of the four feet; when the two fore legs are elevated into the air, the two hind remaining fixtures upon the ground, and the horse in this manner erects himself upon the latter, the act is denominated *rearing:* when, on the contrary, the hind legs are thrown into the air, the body being erected upon the fore feet in the opposite direction, the act is called *kicking.* But neither in abstract kicking nor rearing is there any locomotion—any progression or retrogression. In rearing, the fore feet, through the agency of the shoulders and fetlocks, spring off the ground, and are then lifted with the body into the air, the erection being effected through the contractions of powerful muscles running upon the back, loins, croup, and haunches, the hip-joints operating as fulcra or turning points. Some of the muscles or powers employed being between the fulcra and resistance, while others—those operating upon the hind quarters—being placed behind the fulcra, the levers, through whose agency the movement of rearing is effected, become those of the first and third description.

By persons in general, or, at least, by such as are unacquainted with the *manage,* rearing is often regarded as a vice in a horse. This, however, is a very erroneous view to take of the act. We rather ought to take the contrary, and regard a horse so made that rearing becomes, as it were, natural to him, and who consequently performs and repeats the act with ease and freedom, as, by proper management, convertible into an excellent hackney or charger, or hunter even, rearing being a component part of the act of leaping. I do not mean to assert that rearing, carried to excess or resorted to by the animal to shew resistance, may not prove a vice, and a troublesome and dangerous one; it is but seldom, however, that it turns out such; it is mostly controllable, and may, in proper hands, be turned to excellent account. Indeed, rearing constitutes so fundamental a part of many of the horse's school-taught movements, that, without it, either natural or acquired, the hopes of the riding-master in his education are disappointed: he can make nothing of his pupil but a common labour horse, suitable to drive, unsuitable for riding. Horses require strength of loins and haunches to rear readily and sustain themselves upon their hind quarters.

Short-legged compact horses generally rear and spring with more promptitude than others. Of all horses, thorough-breds are commonly the most untoward learners of the manage, on account of their deficiency in rearing powers; though I have known some notable exceptions to this. Were the riding-school art and practice carried far enough, there appears no good reason why a horse might not be taught to walk upon his hind legs and sit upon his haunches like a dog. Girard mentions, indeed, the instance of a stallion who, at the sight of the mare he was about to cover, was in the habit, of his own accord, of walking for some distance in this manner in his approach to her.

KICKING is the act the reverse of rearing: instead of the fore-quarters being raised, the hind ones are elevated. The muscles employed in kicking are much the same as produce rearing, the difference being, that the fore-quarters are now the fixed and turning points, the hind the moving parts. The shoulders become the fulcra, the hind-quarters the resistance, the power lying intermediately. Although kicking, like rearing, must be viewed, abstractedly, as a manifestation of power, yet it is a manifestation of a most dangerous kind, and one that cannot too early or too effectually be suppressed. From the circumstance of the act being much facilitated and enforced by the abasement of the head at the time—that having the effect of extending the muscles and so enabling them to act with more energy and effect—we learn that the elevation of the head is one of the best counteractions we can adopt in horses disposed to this dangerous vice: we see this well exemplified in dealers' and breakers' establishments; the moment any signs of kicking are evinced, the same moment the head is seized, and thrust up to the highest pitch.

THE ACT OF LEAPING.

THE LEAP is either a sudden spring into the air, in which the feet quit the ground simultaneously, or else it is an act compounded of an imperfect rear and kick in quick or slow succession, according to the manner in which it is performed. The leap can hardly be regarded as an act of progression: commonly, it being in a forward direction, undoubtedly progress is made by it; but it is

possible for it to amount to no more than a jump or a bound off and upon the same ground, as is the case when a horse is said to "buck" in his leaping, *i. e.* to come down upon or near to the spot from which he arose.

BORELLI commences his chapter "*de saltu*" with the proposition that *no leap is made without the joints of the feet being first flexed**, and instances man as with straightened limbs being incapable of leaping. Brutes and insects, however, from having their joints already flexed, can leap at pleasure†. Horses with their flexed fetlocks and angular haunches and shoulders, are ever ready to spring off the grounnd, and the more lengthy and angular these parts are, the greater the animal's power of jumping‡. We see this well exemplified in the deer kind, and in rabbits and hares, and especially in kangaroos, but most beautifully of all in many of the insect tribe§. Horses take leaps with most facility and effect when cantered or galloped at them at a moderate rate, because in that pace they are already prepared to jump, the leap itself being, in fact, but an extraordinary effort of spring and stride made after the manner of, or thrown into, the gallop. The effort made by the extensor muscles to effect the bound into the air is succeeded in the air by a contraction of the flexors: both the fore and hind limbs are in the air drawn up towards the belly, in order that the leap be effectually cleared. No sooner, however, does the descent commence than the fore limbs become spread out forwards and the hind ones let down, wide apart, to receive the body at the landing, and by their yielding position to ward off or mitigate, as much as possible, the concussion consequent on coming to the ground.

LECOQ has happily represented the directing power of the head and neck in the leap:—"The elevation of the neck governs the direction of the leap. If the animal, in order to clear an obstacle,

* Saltus non fit, nisi priùs articuli pedum inflectantur.

† Bruta et insecta aliqua, quæ omnium pedum aut saltem postremorum articulos semper inflexos retinent, possunt ad libitum saltare.

‡ Quò longiores sunt vectes extremi crurum, saltus majores fiunt.

§ Hinc est, quod locustæ, grilli, et pulices longos saltus efficiunt, quia nempe eorum pedes posteriores valde prolixi sunt, ut æquent aut superent longitudinem ejusdam animalculi. Contra in hominibus et quadrupedibus.

wishes to leap high, he erects his head, and by this simple movement, the fore quarters pressing back upon the hind, a vertical direction is given to the spring. If, on the other hand, he only desires, as in the gallop, to leap in a direction forward, the neck levels itself on a line with the ground, and the head, stretching forward to the utmost, carries the centre of gravity along with it, and thus aids the projection; the hind quarters propelling the body, raised from the ground to a height only sufficient to enable the limbs to clear the leap."

It will be seen from what has been said, that a horse will take a leap after two different modes: he will, as the phrases go, take it either "standing" or "flying." "A standing leap" is taken, without any preparatory run, from the ground the animal is actually standing upon. Finding it a difficult matter to spring up from the ground with all four feet at once out of a state of rest, he first rears to the height required to clear the leap, and then, with a sort of kick, flings his hind feet after; the leap altogether being, as I observed before, a compound of a short rear and a short or imperfect kick. "The flying leap," properly so called, is that taken at a gallop, nothing further being required to produce it than to elevate the head and throw extra spring into the stride, the impetus of the pace—which, if but moderate and the horse fresh, he much augments as he approaches the leap—being sufficient to take the animal over: it is the easiest and commonly the safest leap both for horse and rider. To shew the powers of leaping horses possess, some have been known to jump over bars or fences higher than themselves; and Nimrod—the late Mr. Apperley—relates an instance in which a hunter cleared seven yards of space*. Ponies, in general, for their size, are better leapers than large horses: this appears to arise from greater concentration of power combined with the less weight they have to move. Thorough-bred horses are seldom clever leapers; a circumstance owing, apparently, to their deficiency in rearing powers.

* I saw an account the other day in the "Sporting Magazine" of a horse in a steeple-chase making "a jump of twenty-two feet."

LECTURE XI.

PROGRESSION.

Locomotion implies vaguely the act or power of moving from place to place, and is equally applicable to animals with and without feet; PROGRESSION carries in its meaning the notion of feet, and signifies *stepping forward:* RETRO-GRESSION being its antagonist term—the word we use for *stepping backward.*

From the bare facts of quadrupeds being known to be the fleetest of the creatures that move upon the earth's surface, those that are capable of the greatest feats of saltation, as well as of the greatest speed and endurance in the course, we might safely infer that four legs constituted a number better calculated for progression than any other. Men can run and jump with, considering they have but two legs, surprising effect; but neither in the act of progression nor in that of saltation can they compete with certain quadrupeds; neither are many-footed creatures—*centipedes,* as some of them are denominated—to be compared in these respects with quadrupeds, or even, indeed, with bipeds: the number *four* appearing, in relation to legs, to be that which most happily answers the purposes of succession in stepping and propulsion, as well as for that continual shifting of the centre of gravity which necessarily takes place in the transportation of the body.

THE CENTRE OF GRAVITY, in a quadruped standing with its legs in their natural position, will be found to fall *anterior* to a point equidistant from each of the four feet, owing to the preponderance forward of the head and neck: the precise point upon which the line of gravitation will fall, it will be difficult or impossible to determine, that in some inconsiderable degree continually varying from the circumstance of the perpetual changes in the erection and declination of the head and neck, not to notice the unimportant fluctuations that may be caused in it by the movements of respiration and by the constant shifting of place of the viscera. The line of gravitation will be liable, however, to undergo variations of some consequence from the imposition of weight upon the animal's back, and these will be found to be of a nature correspondent with the situation of the weight imposed, its bulk or

amount, stability, &c. Some professional *confrères* of ours on the other side of the water, with that indefatigable spirit of curious inquiry for which they are on occasions so much to be lauded, have been at the pains to ascertain the degrees of these changes, and the manner in which they are affected, both in respect to the animal itself and to its rider.

Messieurs Morris and Baucher*, desirous of ascertaining correctly the influence of the head and neck on the distribution of the weight of the horse upon his four legs, especially upon the fore and hind legs, as pairs, had horses weighed in scales, constructed some years ago at the Custom-house for that especial purpose.

The first placed upon the balance was a hackney-mare, with saddle and bridle on, well enough shaped, except that she was rather heavy before. She was found to weigh in her fore-hand 210 *kilogrammes*†, in her hind 174, total 384, difference in favour of the fore-hand 36; there being, during the weighing, a fluctuation between three and five *kilogrammes* arising from the respiratory and visceral movements. The head was now forced down, until the muzzle came to a level with the chest: this made a difference of eight kilogrammes additional on the fore-hand. Elevation of the head, until the muzzle rose as high as the withers, caused a transfer of ten *kilogrammes* from the fore to hind quarters. The head being released, was next reined in and upward rather: this occasioned a rejection of eight *kil.* on the hind quarters. From these results we may deduce the conclusion, that the more the head is elevated, either naturally or by the hand, the more its weight and that of the neck is equally distributed upon the limbs, without any thing forced in the position.

After these experiments, M. Baucher mounted the mare: the weights then stood—fore-hand 251 *kil.*, hind 197, total 448, difference 54. The horseman being placed in an academical position, had his weight, which was 64 *kil.*, distributed thus: 41 *kil.* upon the fore-hand, and 23 upon the hind. Throwing the body backward occasioned a transfer of 10 *kil.* from fore to hindward; then gathering up his reins, he caused a further addition of 8 *kil.*,

* Extracted from the *Journal de Haras, Juin* 1835, into Lecoq's l'Exterieur du Cheval.

† A *kilogramme* is about $2\frac{3}{4}$ lbs. troy.

making a total of 18. When he stood up in his stirrups, the fore-hand received an addition of 12 *kil.*

These gentlemen with justice observe, in concluding this account of their interesting experiments, that "although the differences caused by the position of the head and neck of the animal, and of his rider, may not, under ordinary circumstances, be of any great deal of consequence, yet do they acquire vast importance in the course of work, such as racing or hunting, the preponderance increasing enormously along with the fatigue."

From these experiments we learn, that although the fore-hand at all times has more weight to sustain than the hind, yet, in consequence of the hind supporting more than its half of the trunk, does this additional burthen not amount to what the head and neck abstractedly would weigh; and we learn farther the important fact, that a weight upon the fore-legs, which, in the ordinary or natural position of the head and neck, amounts to 210 *kilogrammes*, becomes, by reining-up, reduced to 200, and that, with the rider on the back, a weight forward of 254 *kilogrammes* can be diminished, by bringing the head with the bridle-hand into the proper (*managed*) position, to 233, making a difference of 21 *kilogrammes*, or nearly 58lbs. troy. These are results which we, as veterinarians, shall be able to turn to useful account: to the equestrian and riding-master they are full of the greatest interest.

The limbs in the natural standing posture, placed as they are in parallels with the line through the centre of gravity, and being in themselves respectively so many co-operating centres of gravity, and bearing each of them its due proportion of the weight of the body, can none of them be moved in any material degree out of the lines of gravity—which we may suppose to run through their respective centres -without imposing additional weight upon their fellows, on account of placing themselves in a position disadvantageous for supporting the superincumbent load, and consequently creating some feeling of uneasiness, in time increasing to pain. The first act in progression is the result of the stimulus of the will: the brain gives the order through the nerves for the body to be moved forward; one leg moves, the other, through impulse, follows: the uneasiness created in the frame by the elevation and projecture of one limb generating that

impulse. No sooner is the centre of gravity of the body disturbed by the displacement of one of its supporters, than an effort is made to rectify the derangement; the rectification, however, is hardly accomplished before another act of disturbance is commenced: thus, by repeated acts of projecture in the fore limbs, and as repeated acts of propulsion in the hind, is the animal machine moved forwards at rates correspondent with the impetus generated by these movements.

When once set in motion, like the wheels of a carriage, the limbs instinctively continue in similar action or pace until some fresh mandate is received by them from the sensorium, that becoming the signal for some change in the action or pace. The rate the animal is moving at is either augmented or diminished, or his movements are altogether arrested, at his own will and pleasure. And though his master, as his rider or driver, may assume the control over them during the animal's working hours, yet could neither rider nor driver effect any thing without the assent of the animal himself; and it is ever a great deal best to obtain this assent through kind and conciliatory treatment than to extort it through ill usage.

Plain and evident as the movements of the quadruped may appear to the common observer, passing as they do every day under his immediate observation, yet have they furnished a theme for difference of opinion, not less in former days than in our own. Borelli, who commences his chapter *De Incessu Quadrupedum* with the remarkable words, "Egregiè in hac parte allucinantur, nedum vulgares homines, sed etiam præclari philosophi et anatomici; qui potiùs falsæ opinioni per manus traditæ, quàm propriis oculis fidem præstare volunt," is the first to fall into error. The movements of the biped are simple and self-evident; they consist of the alternate advance of the legs, and of the reciprocal shifting of the centre of gravity from one to the other: here there can be no dispute about priority or order of movement. When we have four in place of two legs, however, the case becomes materially altered. It is an easy matter to watch two legs; but it is difficult, nay, in quick movements impossible, to keep the eyes so fixed upon the motions of four as to say in what order of succession they are actually moving or treading the ground. In order,

however, that we may come at that through inference which we cannot derive from actual observation, we will commence with an examination of the slowest movement of all—the walk—and from that proceed to those next quick in succession, the slow or dwelling trot, the hand-canter or slow gallop; and, as we proceed, consider the changes, if any, that take place under augmentation of speed in these respective paces.

Notwithstanding Borelli's prefatory denunciation of the philosophers and anatomists of his own day, for pinning their faith on others' sleeves rather than look with their own eyes, he himself, as I said before, appears in error even in his very first observation. After shewing the parallelogramical figure of which the horse's legs, as they stand in their natural position, form the four respective angles, and that the centre of gravity falls near the centre of the parallelogram—though, according to his plate, placed *behind* that centre instead of before—he tells us the animal makes his first movement with a *hind* foot, "Incipit gressus ab uno pede *postico*;" and assigns as the reason for this, the necessity of establishing a new centre of gravity in advance prior to the movement of progression taking place.

Solleysell knew better than this; he had looked for himself, and not pinned his faith on tradition:—"In a walk," says this true observer of Nature, "the horse lifts the near fore leg and far hind leg *together?* and has them in the air at the same time; and when he sets these down he lifts the other two, which were cross upon the ground; viz. his far fore leg and near hind leg, and so alternately each remove. This is the true motion of a horse's legs upon a walk; which is the same with that of the trot, although the paces are different." Sir Wm. Hope, the translator of Solleysell's invaluable work, "The Compleat Horseman," appends to this passage a comment, in which he says, "Our author is here in a little mistake about the motion of a horse's legs in the walk," and by way of proving the error, refers to his "Supplement of Horsemanship" appended to the translation; where he again agitates the question, finding the same fault with the Duke of Newcastle as he had before done with Solleysell, and in great confidence lays down the law, that "the true motion of a horse's legs upon his walk, according to my own observation, which upon tryal will be found

to be as true as it is new, is *one, two, three, four,* as followeth. The horse, when he beginneth his walk, must either lead with the legs on the right side, or with those of the left: if he lead with those of the right, then the first foot he lifteth is his far *hind* foot, which maketh one, &c." Now, as far as my observation has gone, every horse—I believe I might say every quadruped—usually makes his first step with a *fore,* not with a *hind* foot. I have certainly remarked horses and cattle at pasture, who, with their legs in the parallelogramical or natural position, have, on occasions, moved a hind instead of a fore leg first, in the act of advancing foot by foot, as quadrupeds do while grazing; but I have rarely or never been able to detect the same thing when horses are about setting off in earnest to walk or to trot: it is not at all unlikely but that Borelli might have made his observation on cattle pasturing, though at such a time their movements can hardly be regarded as those of ordinary progression. At the mandate of the will to move forward the fore leg is first put in motion, the order of succession of movement in the walk appearing to be this:—supposing the off or right fore leg to move first, that is no sooner carried off the ground than the left or near hind foot is raised, the former being placed upon the ground again prior to the latter. The two remaining feet move, in respect to each other, in the same order of time, the left or near fore after the off hind, the right or off hind after the near fore; it being observable that, as each hind foot follows in the line of movement of its corresponding fore foot, the latter would very often get struck by the former did it not quit its place immediately prior to the other being placed upon, partly or entirely, the same ground. Now, as the off fore foot gets grounded before the near hind, and as the near fore foot is raised off the ground at the moment the near hind is placed upon it, it follows that the fore feet are performing in manner very or quite similar to the action of a biped, one being off the ground while the other is on, one being in advance while the other is left behind; the hind feet also are performing the same alternate movements, the only difference being that the motions are reversed: in fact, if we imagine two soldiers marching in file, or one behind the other, *out of step,* we shall have a very good idea of the movements of the quadruped animal: the soldier in front representing the fore legs, it is evident

PL II

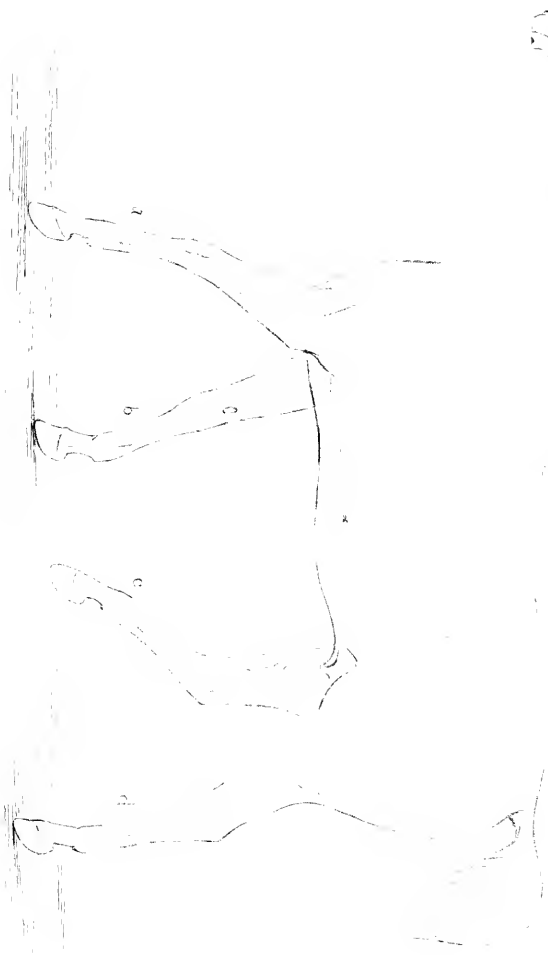
PROPORTION

that unless he gets his feet out of the line of march in proper time, they must be trodden upon by the soldier behind, representing the hind limbs; so that, in point of reality, the quadruped, in his ordinary movements, may be said to represent *a double biped marching out of step.*

With a view of rendering the order of movement of the four limbs of the quadruped more intelligible, it has been common with writers on the subject to note each foot by a letter or number: thus, the fore legs are represented by the letters A, B, the hind by C, D: supposing the A and C to denote the left or near legs, and B, D, the right or off, fore and hind respectively, and that A moves first, D will follow, and B will quit its place just in time for D to occupy it, while A will move off for a second time, just in time for C, the last leg to move, to take the ground A stood upon; up to which period A has moved twice to C's once. Supposing a hind leg, C, moved first, the fore leg, B, having to move next, A would not quit its ground in time for C to occupy it. When it happens that a hind leg does make the first step—as in horses or cattle grazing or moving leisurely or heedlessly—the step proves to be one short of the spot upon which the corresponding fore foot is resting, and so the latter is saved from being trodden upon. In this manner it happens that the fore and hind feet of the corresponding sides become, instead of being in respect of one another diagonally placed, approached close together on one side, standing under the centre of gravity, while on the other side the fore is advanced, the hind being extended backwards. This is not a natural position, but it is one that observably occurs in movements such as I have been describing, and likewise in those that, through any disturbance or derangement in action, are rendered irregular or discordant—as, when in the gallop, the fore and hind legs of opposite sides are in advance. So far as respects the common paces of walking and trotting, this appears to be the analysis of progression, the priority and order of motion of the animal's four legs: acceleration of movement, so long as the same paces be preserved, will not alter this order of succession, though it may quicken it to that degree that time is not given for one foot to reach the ground before the other is lifted off, and the conse-

quence is, that two, three, and even all four feet may possibly be in the air at one and the same time. In the ordinary walk of the horse, two feet are in the air at once, though they are not grounded simultaneously; there being, as Sir W. Hope has well described it, a pretty regular beat in the time of lifting and grounding the feet, in a true or good walk of *one, two, three, four*. Both fore feet and both hind feet moving, in respect to each other, alternately, it follows that no sooner is one fore foot lifted up than a hind foot is put in its place, and that these successions are in regular alternation, if we except the very first step the animal takes with his fore foot; that not being followed up by the hind one of the same side until the remaining two feet have removed.

Richard Lawrence, often an elegant, but not always a practical writer, though he inclines to Borelli's notion of the hind leg being the first set in motion, nevertheless commences his description of the horse's "walk" by the advancement of one *fore* leg, and that being placed on the ground—"*this action being completed*, the off hind leg is elevated and advanced," &c. It must be a very slow walk indeed—such a walk as a horse takes while he is grazing or seeking after food, or as when he most painfully or reluctantly follows the man leading him—that allows the setting down or completion of action of the fore leg before the hind one is lifted. It is quite erroneous to imagine that, "during the walk, the animal is always supported by a triangular position of three legs; namely, two fore legs and one hind, or one fore and two hind legs, alternately." Progression would be tardy indeed conducted upon such a principle as this, neither would there be that spring or lift in the walk which is requisite to constitute a good or a fast one. But *two* feet rest upon the ground in the ordinary walk; and however instable this may render the centre of gravity, the intervals are so short between the alternate transfers of gravity from the two feet quitting the ground to the two coming upon it, that all instability is lost in the impetus of progression. Were the fore foot set down before the hind was raised, the step could not be prolonged beyond the abstract extension of the fore limb; whereas, by the hind one of the opposite side being in the air as well, while the hind of the same side is grounded in advance, by the lever of



the latter a propulsion is given to the body which throws the fore foot in air to a point farther forward than of itself it could have attained.

Restricting our observation to a single limb, three motions are evident in progression: by the first motion the limb is flexed, and the foot lifted off the ground; by the second, a sort of sweep or segment of a circle is described by the foot in the air; by the third, the foot is replaced upon the ground. The French, who have paid more attention to this subject than ourselves, have—after the "inventor" of them, Solleysell—designated these three motions by the apposite terms, *le lever*, *le soutien*, et *l'appui*, which we may render in English by, *the lift*, *the stay*, and *the rest*. The slower the pace the more distinctly these motions are seen. In no pace are they better demonstrable than in what is called "a good walk;" the animal then, with a flexion of the leg, sharply catches his foot off the ground, subsequently making a sweep with it upward and forward, and lastly plants it firmly and flatly down again. Insufficient lifting gives no room for the sweep, and insufficient sweep occasions the toe to strike against the ground before the foot has revolved into a position proper to be placed down; and the consequence is, from the weight alighting upon the toe instead of upon the foot flatly planted, knuckling over, and stumbling, and now and then falling. The quicker the pace, of course, the quicker these motions are performed. In the walk they are distinguishable enough, each limb taking its regular turn in them. In the trot this is likewise the case, until the speed comes to be augmented to that degree that three and even four feet are off the ground at once, and then, though the motions still have to be performed by each limb in succession, subject to interruption from incidental circumstances, they are apt at times to be irregular.

The lift, or raising of the foot from the ground into the air, may be faulty from naturally defective action; from a habit of careless going; from lameness; and from any one of these causes a horse may stumble, and prove unsafe to ride. Without, as many writers on this subject have done, endeavouring to shew in what manner or by what rule a horse, in a walk or a trot, should take up his foot and put it down again, or what particular sort of

action his walk or trot should consist of, I shall deem here it sufficient for all practical purposes that he is *safe* upon his feet in his paces, and manifests sufficient speed in them to escape the denunciation of being "slow." A horse may lift up and set down his feet with mathematical precision and admirable beauty, as, in some persons' estimation, most of the foreign horses do, and yet prove insecure upon his legs, or he may go close enough almost to kick up seven-shilling pieces, and yet prove a safe hackney, of which I very well remember an instance in a mare, a cover hack, belonging to Capt. P., who, notwithstanding she appeared to raise her feet hardly oyster-shell height from the surface, dashed along at a good ten-mile-an-hour trot, without—as the Captain has often assured me—ever making a mistake. I do not make mention of these acknowledged exceptions to general laws that have been laid down by writers on action, with a view of casting any disparagement on them, but to shew that horses will go well and safely in many ways different from those prescribed for them, and in so many different modes, that, to set about to frame rules for action, to say a walk should be performed in this manner, and a trot in that manner, is more, I think, than any man who had in his time ridden many horses would pretend to do. Even Solleysell, who may be regarded as the original framer of these rules, after telling us how a horse should raise his foot, "so as not to cross one leg over the other," and how he should *sustain* his limb, so as properly to poise his body, and how he should put it flat down, "the whole foot equally at one and the same instant of time," admits, still, that "there are some horses which, although they have the raising, keeping up, and tread of the foot very good, *yet have they a bad walk.*"

LECTURE XII.

THE PACES.

Lexicographers derive our English word *pace* from the French *pas*, which we translate *step*: the French making use of the word *allure* for pace, a derivative from *aller*, and literally signifying *going* or *gait*. Pace with us has a double signification: it may mean either a horse's *mode* of going, or the *rate* at which he moves. When we say a horse's paces are good, we leave it doubtful whether we mean that his *action* is good, or his *speed* is good, or that *both* are so; but when we say a horse has but *two* paces, it is very well understood that he is wanting either in his walk or trot or gallop; and this last is the sense in which we use the word *pace* here.

In a state of nature the horse is said to have but three paces or different actions or modes of going—*walk*, *trot*, and *gallop*, all others being viewed as *artificial*, in contradistinction to these three, which are called his *natural paces*: the *canter*, the *amble*, and any other pace a horse may be taught to go, consequently, come into the latter class. This division, however, is not quite in accordance with truth. Though we may admit the amble to be altogether an artificial pace, assuredly we have all occasionally seen foals cantering after their dams. Therefore, the canter must be in part natural, at least, strictly speaking, can be regarded only so far as artificial that it is not, like the others, always to be observed in the natural state, or that horses are to be found that never *naturally* canter, or who are exceedingly difficult to be made to canter, and with every pains that can be taken with them, can never be made to do so with any degree of grace or perfection. Notwithstanding these objections, however, we deem it more consonant with observation and practice to regard the canter as an artificial pace.

Let us first consider

THE WALK.

The walk is the pace the quadruped, by nature or habit, breaks into out of a state of inaction or quiescence. It is the slowest of the paces—that by which all the others are more or less influenced, and so might with reason be emphatically denominated the *primitive* or *cardinal pace*. The best earnest a horse can give us of "what he can do" in other respects, is his walk; a clever walker will perform well in his trot, and most likely in his gallop likewise: indeed, I have heard eminent turf-men say, it is rarely that a good racer is a bad walker. A horse so made that walking is either difficult or impossible of performance to him, without perpetual blundering and danger of falling, may gallop or canter to satisfaction, but cannot be expected to be a good trotter, the walk and the trot being paces requiring similar conformation and powers of progression. There are some people who will not look at a horse (for purchase) that cannot walk. For a hackney, park or pleasure horse, charger, and, above all, for a lady's horse, good walking is indispensable; for a hunter it is next to indispensable; and in a racer highly desirable. By *good walking* I mean the *powers* or *capabilities* of walking well: a horse not in possession of that form and action that enables him to step properly or safely in his walk I call a bad walker; and not one who has been caused to walk improperly or amiss, either through any mismanagement in the training or using of him, or any anormal condition into which he may have been thrown by accident or disease: the epithets *good* and *bad* have, in fact, reference here to natural or original disqualification, and not to any thing incidental or superadded.

The physical properties foreshewing a horse to be a good walker must be collected principally from what has been already said about form, in particular of the fore legs and shoulders; at the same time the hind limbs must not be overlooked, they, with the fore, concurring to make the good walker. We may often, when we behold certain anormal or ill construction of the limbs, without hesitation pronounce it impossible that such a horse can walk well; though we are liable to be deceived in our opinion about the

pace being properly executed when we see form that we cannot help admiring. It would be, indeed, a perfection in this branch of our art, could we deduce action from form: although we may venture to decry what cannot fail to perform ill, we cannot always predict what will act well; and one reason why we cannot is found in the circumstance of the physical powers requiring a *savoir-faire*, which, being derived from vitality, is without the pale of our calculation. Notwithstanding, we shall always do well to "observe," with Solleysell, before a horse is put in motion, "if he be right planted upon his limbs; because upon the right or wrong posturing* of a horse, when he is standing still, doth depend, not wholly, but in part, his good or bad going and carriage." In other words, a horse *naturally*—and not by trick or art shewn—standing *well*, is not likely to perform *ill*.

We now come to the question, what constitutes *good walking?* "For a horse to walk well," says our excellent authority, old and venerable Solleysell, "his steps should be quick"—he should "make two steps with his feet in the space that many horses make one."—"The four adverbs, LIGHTLY, SURELY, QUICKLY, EASILY, express all the most nice and curious can desire in a horse's walk." In this quaint description how much truth and nature sparkle forth! What reader that does not in it discover the lightsome, nimble, nodding hackney, catching up his foot, quickly and gracefully twirling it in the air, and afterwards putting it fairly, flatly, and firmly down upon the ground; "beating," as Adams† says, with his feet as he goes along, "one, two, three, four," and with that regularity and decidedness that to the ear of the experienced horseman they tell "a music" he alone knows the sound of. Every man conversant with horses recognizes *this walk of the hackney* the moment he beholds it—there is no mistaking it; and the same as soon discovers the indifferent or *bad walker*.

* In the translation of Solleysell's work by Sir W. Hope, this (which in the original French is *camper*) is rendered camping: an un-English expression, and one that means—if it means any thing—the stretching out of a horse as in the act of staling. The signification of the author here, is the *posture* or *position* which a horse, *left to himself*, will assume; and not any he may be thrown into through the art of the dealer or the cunning of the groom.

† Analysis of Horsemanship.

It is easier to point out defects in a horse's walking than to define in what good or proper walking should consist—like many other things, we know it when we see it, but we hardly know how to describe it. Good walking will be found one thing in the cart-horse, another thing in the hackney or hunter, and a third thing in the race-horse; and no one or single description will apply to the walks of all three breeds or kinds of horses. Again, foreign horses—Arabians, Spaniards, Dongolas, &c. walk in quite a different style from British horses. There is a variation in the walk even beyond this. Two hackneys or riding horses will not walk alike, though both may be acknowledged to walk well: one will have the true hackney action, the sharp or quick *lift*, the graceful turn in the *stay*, and the flat and firm *grounding* of the foot, which we all so much admire, and which by writers in general on this subject is described as *the proper manner in which a horse should walk*, as though there were no other; while the other hackney — displaying perhaps more breeding — will, race-horse like, lift more leisurely, and, instead of twirling his foot, will cast it pointedly forward in a horizontal line, and place it daintily upon the ground, as if he took every pains to do so with precision; and withal will step, perhaps, with perfect safety, and advance as fast as the quick-actioned hackney. Supposing, therefore, we assume good walking to consist in speed and safety, adding thereto even elegance or gracefulness, there are manifestly *two*, if not more, ways of accomplishing it; and these two, being so different, are sufficient to set at defiance any single rule we may lay down for its performance, or any single definition we may give of it. So that a horse's walk be neither slow nor unsafe, nor (to the rider) uneasy, we shall not widely err in regarding it as *good*, let it be performed in whatsoever manner it may. However fast it may be, if insecure, it is seriously faulty; and though fast and safe, still, if rough or unpleasant to the rider, it is objectionable. In fine, the walk of a horse should be estimated rather by its effects and products than by the manner or method in which the animal performs it.

FAULTY OR DEFECTIVE WALKING may proceed from various causes. It may be *natural* or *acquired*. A horse may be so formed that all the pains in the world cannot make him walk pro-

perly or well; and the best walker may be rendered otherwise by mismanagement, or from unsoundness, or age. That man will act wisely who refuses to purchase or to have any thing to do with the natural bad walker: if he cannot walk well, he cannot trot well, and will most likely prove insecure in one or both paces; and though by a judicious system of *manège* he may and will probably turn out susceptible of improvement, still he will, as I said before, by no pains be convertible into a good or safe walker and trotter; and, therefore, the best counsel I can give a man who wants a horse for riding purposes is, I repeat, to refuse the purchase of *the natural bad walker*. But good walking may be destroyed or converted into bad walking by injudicious training or riding. It is surprising what a difference—a difference known only to horsemen—proper and improper riding makes, even in horses that are by nature excellent walkers. I have often heard my father—who was a good horseman—say, he could tell when another man had been riding his horse from the difference he felt (the next time he rode, himself) in his horse's walking: the hand and the leg have so much to do in inciting the walk, while they restrain the shuffle, and prevent any attempt at a trot. Such a horse, bad or no walker from habit, will shew no natural deformity: his make will be that calculated to produce good walking, and he will perform faultlessly in his trot, and most likely in his gallop as well; all which will go to shew that his walking pace is bad through mismanagement, and not from natural incapacity. His walking, however, may not be destroyed; it may, by the method of riding, be but altered. From being a free and far stepper he becomes a short stepper, dwelling upon his steps in consequence of being reined in, prolonging his *stays*, and thus, altogether, altered in his walking action from what he originally was, affording an example of what may be accomplished through difference of riding. Foreign-bred horses step short by nature; nor is it possible, I believe, through any system of *manège*, to make them step *à l'Angloise:* they manifest a good deal of action in *lift*—throw their legs about much—have a longer *stay* than our horses, and put down their feet too little in advance of the spots from which they were lifted to make much progress. Again; stepping short, either by nature or from habit, must be distinguished from the short, tender, or cramped step of

the horse that has been for any length of time in a state of disuse, or standing in the stable without exercise, as well as from that of the foundered or groggy horse. In cases where any doubt exists in the mind of the examiner, whether the short-stepping walk proceed from one cause or the other, a trot will commonly dispel it, and exhibit the case in its veritable light.

THE LIFT of the foot in walking may be insufficient, or it may be greater than is required for the purpose of progression. In the former case, the horse will be likely to hit his toe against any stone or prominence in his way, occasioning him to stumble; and through the effort he makes with the opposite fore leg to save himself, will run great risk of again faltering and falling; the foot coming to the rescue of the other, not perhaps prepared to come flatly down, descending upon its toe, upon which the imposition of weight is sure to cause knuckling over, and so down inevitably the horse must come. But there may be too much lift—over much action in the air: the animal may in his walk even, and more still in his trot, throw his legs about, cross them probably, in that manner that he makes but short advances in progression, being after all but a *slow* walker, and moreover is extremely likely to strike one leg with the opposite foot, either at the fetlock or beneath the knee, the latter being what is called *speedy-cut.* Independently however of the liability to strike, it by no means follows, because a horse has high or free action in his walk, *ergo,* that he is a safe walker. Some of the foreign horses are any thing but secure steppers; they drop and suddenly fall down upon their knees, and, I believe, from weakness in those joints. Neither does it follow that horses that go near the ground, *daisy-cutters* as they are often called, are of necessity unsafe walkers—many instances occur proving the contrary*. The lift of the foot, in good walking, should be sufficient to clear all ordinary obstacles in the road, and the action should be *collected,* within the sphere of the animal's perfect control, and not *sprawling;* and the foot should be flexed in the air without any great deviation laterally out of the line of direction, forward and backward, turning the toes either much out or much in—though the latter is less objectionable than the former—being

* One will be found mentioned in a preceding lecture.

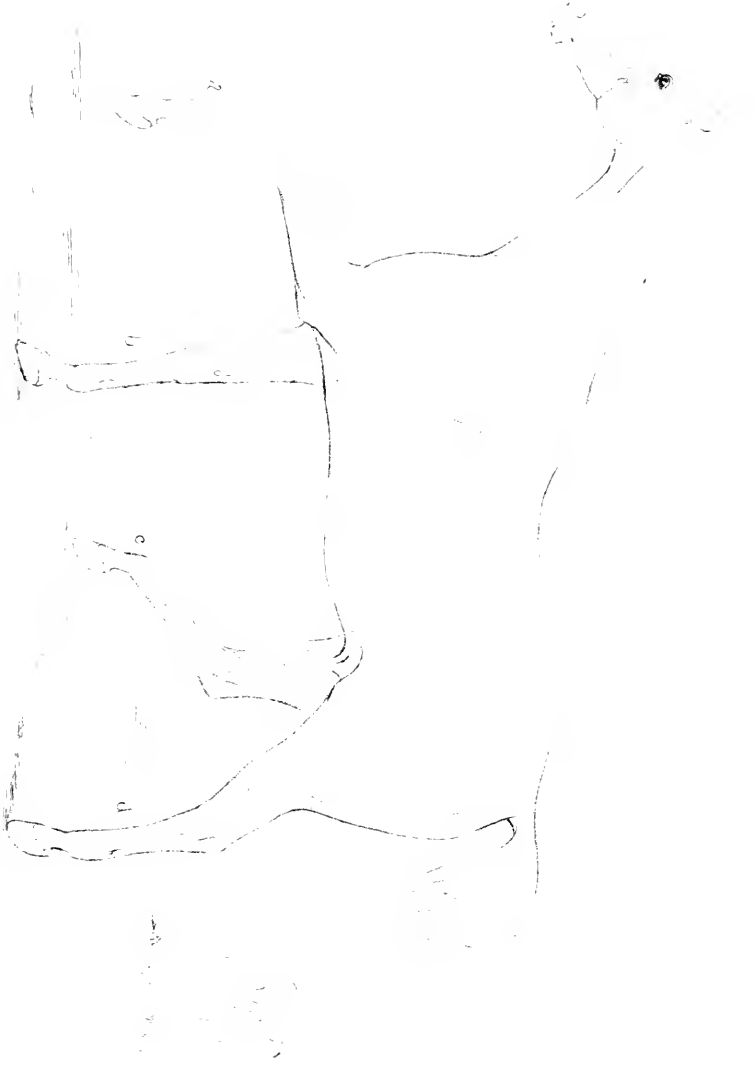
both faulty in action. And a horse that flexes his foot well in the lift, exhibits his shoe during the eversion of the foot, and that has a nimble though short step, though he may not make more ground or even so much as a horse with straight action, will be a much pleasanter hackney: in fact, this is the action that has already been described as, *par excellence*, the hackney action.

THE GROUNDING of the foot should be flat and firm. To the eye of the observer there is the slightest perceptible difference between the toe and heels coming to the ground, in favour of the former; a difference that need not disturb the horseman's good old rule, that *a horse in his walk should place his foot fairly and flatly down.* Alighting upon the toe, as some horses with high and round action are apt to do, renders the step instable until the heel comes to the ground; or, should the superincumbent weight preponderate forwards, then knuckling over is the result, and an awful drop, or else a fall, the consequence. Horses that go upon their toes have, for the most part, strong upright feet, with concave soles; whereas, such as have flat feet are more likely to go upon their heels, to save their weak crusts. We have an illustration of this in the going of lame horses: such as are lame from contraction or navicular disease, feeling the pain or tenderness in their heels, tread upon their toes; and such as feel the pain in their toes or crusts, horses that have or have had fever in their feet, do all they can to step upon their heels. It is curious to observe—and one way in which we may do so is by the wear of their shoes—how different the tread of horses is: at the same time, we must bear in mind that the wear of the shoe not only tells how the horse treads, but also, in some measure, the manner in which he takes his foot off the ground.

THE RATE OF WALKING in a horse is faster than in a man. Fair toe-and-heel walking at the rate of four miles an hour, in a man, is accounted a good pace: a horse we reckon ought—to do well—to walk five miles an hour; the ratio between the two appearing to be about as 5 to 4. But how would these relative differences stand, came they to be multiplied? Would a horse walk a hundred and twenty-five miles while a man was walking a hundred?

THE TROT.

Trot—a modification of our word *tread*—denotes in equitation the pace ranking in order, in point of speed, between a walk and a gallop; neither slow like the one, nor swift like the other. Although the limbs in the trot, in reference to the fore and hind of the same side, have the same contrary or diagonal motion that they have in the walk, i. e. the off fore and near hind, and near fore and off hind, are both in action, as well as at rest, at the same intervals of time, yet is the trot not an accelerated walk, but a distinct pace by itself, as may be proved both by the animal's manner of going, as well as by an analysis of the two paces. We have already seen that, in the walk, although two limbs are in motion at one time, yet do the four succeed one another, in being lifted and grounded, in some such regular manner as may be represented to the mind by counting aloud, one, two, three, four. Not so, however, with the trot. No sooner are the limbs put into quick motion than the time is found too short for them to play to this fourfold step, and the consequence is, instead of reckoning four, we can hear but two beats; those of the contrary fore and hind feet being synchronous. This will account for the spring or elasticity of movement of the trotting horse; as well as for the rough action of the *runner*—as the horse is called who trots after the manner of walking, instead of possessing the synchronous diagonal movement, and who, as is well known, is commonly a *bone-setter*. In this latter kind of trot, springless and uneasy though it be to the rider, regularity or harmony in the motions of the limbs is still preserved; whereas in the jumble—*trot* can it be called?—of trotting before and galloping behind, and in what John Lawrence significantly terms *hitching*, there is evident discrepancy in the movements, produced by overstrained efforts to accomplish that which the powers or capabilities of the animal are inadequate to. And this is the jumble of a pace—this the confusion of trot and gallop—butchers' boys and cads, *et hoc omne genus* (who in riding or driving are saving time by minutes, whilst in lounging or doing worse they are squandering it by hours), urge their horses



into. Lecoq speaks of the trot of such horses as being *decousu*, i. e. unconnected, inharmonious; and ascribes it to weakness.

Not only is the motion of the limbs quicker in the trot than in the walk, but their sphere of action is augmented—they perform larger gyrations in the air, notwithstanding they have less time to make them in, and, on this account, a very small amount of time indeed is allowed them for grounding and again lifting themselves. In rapid trotting, the tread of the hind foot—the propeller of the machine—upon the ground is barely sufficient to afford the requisite *fulcrum*, the fore-foot at the instant simply sustaining the body in front while this propulsion is being accomplished. And during this acceleration of the pace, every time fresh impetus is given to the moving machine, whereby it is lifted with a spring into the air, all four legs are off the ground. Common close observation shews that this is the case, the best situation for the observer being, as Lecoq says, a pit or hollow deep enough to place his eyesight on a level with the ground upon which the horse is trotting. Vincent and Goiffon, Lecoq informs us, have made a calculation, that the time occupied in moving the foot in the air is thrice that consumed in the grounding of it: supposing the treading of either foot to occupy a second of time, its revolution in the air takes three seconds. Lecoq, however, himself, thinks that this latter interval is over-rated. It is evident that the tread of the foot—the hind one in particular—must be both forcible and instantaneous; *forcible*, to give the requisite propulsion; *instantaneous*, because the swift motion will not admit of more: what the precise periods, however, may be, either for grounding or suspension, or their proportionate intervals, must, we suspect, be matter more of speculation than of fact.

By an increasing rapidity of movement the momentum, once generated, is readily sustained through alternate beats or treads of the hind feet, the fore limbs appearing to effect little else than, in diagonal directions with the hind feet, propping or lifting the fore quarters. The trot carried to this springing celerity of movement—this *flying* or *swinging trot*, as it is called—becomes rather an artificial than a natural pace. By all horses it is not acquirable: some seem formed by nature to take it; others, by dint of practice and

perseverance on the part of their riders, get a knack of it; others there are that cannot by any means, harsh or mild, be made to perform it; but in the effort are driven either into the butcher's *hitch* or into the jumble of trotting before and galloping behind. Lecoq calls such horses *foibles*, weak; and it is not unlikely some of them are so, either from natural formation or in consequence of some inflexibility of the loins or hocks, &c. We are far from being able, however, at all times to say to what the incapacity is owing.

Having considered the *order* of movement of the limbs in the trot, and made some allusion to the intervals of time consumed in grounding the feet and in making the necessary revolutions with them in the air, we come now to look at the relative positions they occupy in action, and see how it happens that they do not interfere one with another. In the slow or ordinary trot, the hind limbs are so carried underneath the body that their foot-marks fall near about those made by the corresponding fore feet: the fore foot has no sooner left its place of implantation than the hind foot occupies it. In the walk, the hind feet ordinarily in part cover the prints of the fore: as soon as the animal strikes into a trot, they quite cover these prints; and as the speed increases their relative advance gradually becomes greater, until the hind overstep the fore feet, and would and must tread upon them, were it not that the former were advancing in different lines of direction from those in which the latter are stepping. Mostly, these lines are within the other; the hind feet of a well-going horse treading (by turns) quite under the middle line of the body—that line along which the centre of gravity moves—and in this manner avoids collision with the fore feet: in some instances, however—in horses that "go wide behind"—the hind feet are planted to the outer sides of the fore ones, and thus equally advance clear of them. There are instances or occasions where they take the same line of progression with the fore feet, and then collision is the inevitable consequence—*overreach* as we term it. This, however, is a rare occurrence, save when the horse is thrown out of his natural action or forced beyond his ordinary effort by the injudicious or inhuman conduct of his rider or driver.

I have shewn, in another place, that strength and flexibility of

loin have much to do with speedy progression. According to the observations of Vincent and Goiffon*, the spine of the back grows incurvated during rapid trotting, the effect of which is to open the shoulders, causing them to spread farther apart in action, and thus to give more room for the play of the hind feet through the interval between the fore feet. In ordinary trotting, these gentlemen say this does not happen; and hence they account for the re-action felt by the rider, through the back, in one case and not in the other.

THE TROT is accounted, *par excellence*, the pace in which the British horse excels. Foreign horses, in general, are better adapted for the canter or the manege than for trotting, their trot being high and round, and therefore, in rapid going, necessarily very quick, and yet, with all their action and agility, they do not make progress—do not get over the ground—with any thing like the speed of an English trotter. The action of our trotting horse is that which *tells* in progression rather than makes any parade in gait; and yet this is not of any one peculiar kind, good trotters going, as our dealers say, "in more forms than one."

As was observed on a former occasion, a great deal may be learnt of what we are to expect in the trot by noting well the walk of the horse: if the slow pace be cleverly performed, we have good earnest for the creditable execution of the quick pace. We may even carry our observation farther than this: we may often tell the *manner* in which the horse will trot from paying attention to his mode of walking. Horses trot with *high* or *low* action, *round* or *straight*, *darting* or *dishing*, *ordinary* or *grand*, &c., depending upon the manner and energy with which they move their limbs. People in general, in estimating trotting action, are too apt to confine their observation to the fore limbs, forgetting that the hind are the propellers of the moving machine, and that upon them, after all, must mainly depend progression. While height and rotundity of action give beauty, straightness or projecture give progression; and a certain combination of both it is that constitutes what we are in the habit of so admiring as to call, by way of distinction, *a grand trotter*. Perhaps, in our country, hardly any better examples can be adduced of this perfection in trotting than the

* As stated by Lecoq., op. cit., p. 385.

royal stud furnishes: the Queen's (not the state) carriage-horses—horses standing from sixteen to eighteen hands in height—whose grandeur or beauty of action is exceeded only by the awful rate at which they get over their ground. Our late sovereign, George the Fourth, was celebrated for his noble coach-horses: their trot in the royal carriages was of the finest description, and he brought his teams to the highest possible degree of perfection by casting (for sale) every horse who was not able to keep pace with his more fortunate competitors. Of a trotting hackney a better epitome can hardly be given than that contained in the distich of the old song—

> "He was such a one to bend his knees,
> And tuck his haunches in*;"

the "tucking of the haunches in," as I remarked before, having a mighty deal to do with the pace. "The horse that points out his fore legs, and goes with his knee straight, is no trotter," says John Lawrence†; "he loses time by over-striding."

So far as we are able, from general observation, to say what is the fittest form or structure for a trotting horse, we may set it down as a rule having but few exceptions, that shortness of the shafts of the cylindrical bones of the limbs, and uprightness in the joints, are more conducive to the performance of this action than length and obliquity. Few race-horses can trot well, owing to the lengthiness of their limbs and springiness of their joints; and as for cart-bred horses, though they possess the requisite shortness of make, their comparatively broad and lax structure is, as I said before, calculated rather for strength than speed. In general, horses celebrated for feats of trotting are by no means pleasant hackneys: when put out at their speed, they use their limbs with that quickness that does not allow time for the operation of sufficient elasticity to amount to spring, and with that force which greatly tends to destroy elasticity; the consequence is, that many of our most famous trotters are what riding *connoisseurs* call "bone setters."

* I know not if I quote correctly. In truth, I have almost lost sight of the famous old ballad.

† Treatise on Horses, &c. 1810.

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To conclude this lecture with some accounts of the feats of trotting horses, we cannot, that I know of, consult better authority on what has been performed in days gone by than John Lawrence, who appears, as well as being a sporting character himself, to have been at some pains to chronicle these performances. "The fastest trotter" which, this writer has good reason to suppose, "has ever been tried in England, was called ARCHER, from the name of the person who brought him to London." Mr. Lawrence could not conceive Archer's *rate* of trotting (for a short distance) "could be below *twenty-five miles an hour!*" A brown mare, the property of Bishop—a London dealer in horses—not so speedy as Archer, but of greater strength and endurance, is said to have been the first horse that ever trotted sixteen miles in one hour with twelve stone of burthen, and she performed the distance in fifty-eight minutes and some odd seconds. "In 1793, Crockett's grey mare trotted one hundred miles in twelve hours, and had twenty minutes to spare."—"In 1792, a yellow-bay gelding, called Spider," * * "trotted twenty-four miles in an hour and an half." And Mr. Lawrence's "own brown mare, known by the name of Betty Bloss," * * "trotted fifteen miles in one hour, carrying fourteen stone." Lastly, according to the same authority, "the brown mare Phenomena performed seventeen miles in less than fifty-three minutes, carrying a lad of five stone in weight; and her proprietor afterwards offered to match her to do nineteen, and after that nineteen and a half miles within the hour, both of which offers were declined.

In our own days the Americans appear to have carried off the palm for fast trotting. We learn from a newspaper called the SPIRIT OF THE TIMES, published at New York, and dated 29th July, 1843, that

In June 1841, a bay gelding, called CONFIDENCE, trotted in harness over the Beacon Course a mile in two minutes and thirty-five seconds, beating a horse called WASHINGTON.

In November 1842, DUTCHMAN, another bay gelding, performed the same distance in the same time, ridden, over the Hunting Park Course, beating the bay horse, RIFLE.

In June 1841, VOLCANO trotted a mile over the Beacon Course in the wonderfully short interval of two minutes and thirty-one

and a half seconds; taking but half a second more to achieve the same on the following month. And over the same (the Beacon) Course, in May 1842, RIPTON, a brown gelding, trotted in harness two miles in the astonishing small space of time of five minutes and seven seconds!—the greatest feat of the kind, probably, on record.

THE GALLOP.

A horse by nature walks, trots, and gallops; and with these three paces his speed may be said to receive augmentations from the comparative slowness of the first until it arrives at the proverbial fleetness of the last: hence the word *gallop*, in a variety of figurative senses, is used to imply fast motion or great haste. Its literal meaning, as regards quadrupeds, is given in our dictionaries to be *moving forward by leaps;* and the animal in the act of galloping creates that motion in his body which certainly strikes the casual observer with the notion that he is making at the time a succession of jumps or leaps. Indeed, some equestrian writers have gone so far as to define the gallop of speed or racing gallop to be nothing more than a repetition of leaps. Mr. Blaine observes, that "as the two fore feet at once beat the ground together, and then the two hinder, so it is evident that the gallop of speed is nothing more than *a repetition of leaps*." Lecoq likewise describes the *galop de course* as consisting in *une succession de sauts*. In the face, however, of these worthy authorities, I must say that, to me, the gallop and the leap appear acts of a different nature, and consequently that we are in error when we say that the one is no more than a compound or repetition of the other. In galloping a horse—in hunting for example—the rider needs no person to tell him of the moment his horse is taking a leap, however trifling it may be: his own sensations inform him of every *grip* or furrow his horse leaps in his course, and should he have occasion to make a succession of such jumps, the rider's sensations in his saddle are of a very different—very uneasy—kind, compared to such as he experiences during the act of galloping. This arises from two causes:—from the spring or movement of the body necessary to produce the leap being more forcible and sudden than that required for the gallop, and from the latter being created and con-

The Gladiator

tinued rather by the successive action of the two hind feet at one moment, and of that of the two fore feet at the next moment, than by the synchronous efforts of either biped, as happens in the leap. The two great propellers of the animal machine—the hind feet—are in the leap required to act *simultaneously*, to make one grand propulsory effort: not so in the gallop, that being a movement requiring maintaining, not by synchronous exhausting efforts of the hind feet, but in swift succession, first by one then by the other; and the same as regards the office performed by the fore limbs; which latter probably amounts to little more in effect than the sustentation of the fore parts of the body.

The vault into the air required for the leap is only to be effected by extraordinary subitaneous effort; but the stride of the gallop, requiring frequent repetition, does not exact this effort—amounts, in fact, to no more than a sort of *lift* from the ground, multiplied into a reiteration of forcible heavings forward, maintaining, increasing, or diminishing the momentum of speed, effectuated by throwing the hind feet as far forward underneath the body as possible, plunging them one after the other with inappreciable rapidity into the earth, and thus by two strenuous thrusts against the ground, one in aid of the other, working the animal machine onward in its fleet—almost flying course. In the gallop as in the trot, no sooner is a certain momentum acquired than by each successive propulsion of the hind feet the body is sprung or lifted off the ground, flying, as it appears, in the air; and the greater the speed the more this volitation becomes apparent; hence the appellation given to the pace manifesting the utmost speed of FLYING GALLOP. Even this, however, according to my judgment, is an action different from leaping. When a horse leaps or jumps in his gallop—which he will do sometimes when he is *beany*, and has but just emerged out of his stable—he is said to *buck*, because his action then resembles that of the deer, in whom the gallop might with a great deal more propriety be called a succession of leaps: even the deer, however, cannot continue this bucking action after being driven into his speed or into a state of fatigue, shewing that in him it is to be regarded rather as a gambol than as his proper working onward action. And that the hind and fore feet, in pairs, are not grounded synchronously, I think, admits of demonstration in two ways:—

first, by the position they assume, one in advance of the other, in the gallop; secondly, by the clatter the steps of a horse in a gallop are known to make upon hard or resonant ground, and which may be heard either by a spectator or by the rider himself; whence we probably derive the phrase *a rattling gallop.*

In the WALK, we found the four limbs acting in such regular alternation, crosswise or diagonally, that they seemed to beat one, two, three, four. In the *trot,* we found this regularity of movement, in regard to *time,* interrupted and in part destroyed; the same *order* or succession of movement—the diagonal—being still preserved. In the gallop, however, both the time and order are inverted. The diagonal movement is no longer seen. Both fore limbs are projected together, one more or less in advance of the other; and their projecture is followed by the simultaneous advance of the hind limbs, the feet of the latter lodging upon the ground contiguous to the places just quitted by those of the former, with that hind foot foremost which corresponds to the fore foot that is leading. So that galloping differs (leaving the consideration of speed out of the question) from either walking or trotting, in the circumstance of the fore and hind feet being projected in pairs, and also in that of the fore and hind feet of the same side being generally in advance of their fellows.

With the fore leg which is projected in advance of its fellow, the horse is said in his canter or gallop *to lead:* commonly, more from the directions of art than from any propensity of nature, the *right* is the limb that takes the lead, it being by riding-masters and horsemen of judgment regarded as a fault to lead with the left leg. Whether natural inclination be for the right or for the left leg, I will not pretend to say; but this I know from experience, that it is an extremely tiresome task to make some horses lead with the right leg. There are very good equestrians, however, to whom it is quite a matter of indifference which is the leading leg, providing the horse canters or gallops *in a proper form.* The slower the pace the more conspicuously prominent, in general, is the leading limb: as the pace increases, this becomes less and less remarkable, until at length, at full speed, so even is the projecture of the limbs that it is difficult or impossible to say which is taking the lead. Where the opposite leg is leading behind to what is in

advance in front, the harmony of action being destroyed, so uneasy a seat is given to the rider, as well as a shake of that nature to the whole frame of the horse, that forbids, on the part of both, the discordance to be of long continuance.

The action of the limbs in pairs it is that renders it so difficult—nay, generably impossible—for a horse to strike at once into a gallop; most horses requiring some preparatory movement before they can work their limbs into the required action and speed. The momentum once gained, however, the machine by repeated strokes of the limbs is easily kept in motion. The knowledge of this fact constitutes the basis of the wager so commonly offered by connoisseurs, that a man shall run 50 yards before a horse can gallop 100. Were the race prolonged to 150 yards, the man would find he stood not the slightest chance of winning it.

French equestrians distinguish three kinds or gradations of gallop:—1. The ordinary or hunting gallop, or the gallop with three beats; 2. The manage gallop, or the gallop with four beats; 3. The racing gallop. The first and third of these accord with our own practical notions of the pace, but the second can mean no more than our *canter:* though where to draw the precise lines between the canter and what we call *the hand gallop,* and between the hand and the hunting gallop, or between the latter and the gallop of full speed, may prove more than any of us are able satisfactorily to do. There is, certainly, a wide difference between the paces of canter and gallop; but to say with precision where one ends and the other begins—whether the canter ought not to exceed six or seven miles in an hour, or whether it ought to amount, as others think, to eight or nine miles in the time, are points too knotty for me, as a veterinarian, to unravel. Neither is it easy to determine whether Lecoq be right or wrong in pronouncing there are but three instead of four beats to be heard in the ordinary gallop; though I hesitate not to think he is in error when he says, that the gallop of speed is a pace by itself in which the body is transported through *a succession of leaps.* Mr. Blaine, indeed, notwithstanding he pronounces the gallop of speed to consist in a repetition of leaps, refuses assent to the doctrine of "foreign manege masters," that "all the gallops are distinct paces. On the contrary," says he, "I think them all constructed of one

and the same action; of which a sufficient proof presents itself in the certainty that the horse can change from either of the gallops into the other without art, without alteration of his centre of motion or equipoise, or without interrupting the harmony of the moving members, but merely by an increased or diminished effort of the same action."

Lecoq presents us with an interesting analysis—a thing difficult in practice to obtain—of what he regards as the veritable, the ordinary gallop. In a complete stride or step, "the body is supported, 1st, upon one hind foot; 2dly, upon two diagonal feet; 3dly, upon one fore foot; 4thly, it is without support—in the air." "And this succession of tread is so conducted," adds Lecoq, "that the prints made by the two diagonal feet appear in advance of those of the opponent diagonal feet: the horse being said to gallop with the *right* or with the *left* leg, according as the right lateral biped or the left take the lead."

Barring the broad and obvious distinction there exists between the gallop and the canter, it is difficult, if not impracticable, as I said just now, to draw any lines of division in the gallop farther than as regards the rate at which the animal is going. At the same time we must all admit that the gallop, as we witness its performance by horses of different breeds and shapes, is a pace admitting of many variations from any standard of galloping action or rate of speed we may presume to set up. Lecoq's marks of distinction of four, three, and two beats, will not, I think, bear the scrutiny of practice; and even if they did, the performance of any of the gradations of the pace, from the canter to the gallop, will prove altogether different by the heavy or cart-horse from what it would by the light and active or thorough-bred horse. And again, of horses of the same breed, some are formed peculiarly well for galloping; whereas the make of others seems better adapted for trotting. The racing gallop is evidently so far a peculiar pace that no other description of horse can execute it with the same perfection as the race-horse. With the dart-like projecture of his limbs, lifted no more than sufficiently off the ground to go clear of obstacles; with his bending his back and loins, and lowering himself, and laying himself out at his full length along the ground; and with the vast strides and springs

forward he in this position is capable of making, he in fleetness excels almost every other animal, and far surpasses every fellow of his own kind, not thorough-bred, that can be brought against him. So far the race-horse—I might in pride say *the English racer*—is an animal veritably *sui generis*. Contrast the clumsy gallop of the cart-horse—if the pace as he performs it can be so called—with the airy skimming movement of the race-horse; nay, compare the high, round, or clambering gallop of the foreign horse, or that of many of our hacks, our trotters especially, with the racer's action, and how strikingly different are they found! All this will go to demonstrate the truth of what I have just asserted, that, so far as regard different horses, there are many and various kinds of gallops, though to class them or make any sort of useful arrangement or distribution of them is a task to which we, for the present at least, may find ourselves incompetent.

The circumstances of the cart-horse hardly being able to gallop at all, while the race-horse is evidently "made for galloping," may serve, on due consideration, to throw some light on that conformation of body and limb which is peculiarly characteristic of a good galloper. Length everywhere in the form of the body appears indispensable: length of neck, back, and loin; length of limb, of arms, and thighs, and pasterns, are all seen to advantage in the well-formed racer, and must predominate in any horse we may select in expectation of being a good galloper. On the other hand, shortness of make, combined with uprightness in the joints, such as we evidence in the dray or cart horse, may serve for trotting, but can in nowise answer the purposes of galloping: it is impossible for spring and speed to result from such conformation. We are not, however, to take it for granted that length of body and limb are the only requisites—that all horses so made can gallop: some there are that have not the faculty of speed, other requirements being wanting. It would, indeed, be a consummation of the equestrian's skill could he in every instance connect speed or action with form, and determine when, for want of the necessary adjuncts, although the form was present, the speed must be absent. As, however, I observed on a former occasion, in consequence of the vital influences having a share in the production of action and speed, there seems faint chance of the horseman ever

arriving at such perfection in his art, even supposing the knowledge to be within our reach: which, by the by, we are by no means assured of.

So long as the horse is cantering or but hand-galloping, the hind feet, advancing in lines either between or to the outer sides of the fore feet, impress the ground somewhere about the places the fore feet have just quitted; as the pace increases, however, the reaches forward of the hind feet become so much the greater, thus proportionably augmenting their leverage; which, combined with their increased quickness of action, accounts for the additional speed. Horses whose chests are not contracted, and who tread close with their hind feet, throwing them well under the centre of gravity, advance them in the interval between the fore limbs; such as have narrow chests or go wide behind throw their hind feet forward in lines outward of the fore ones: in both cases, at speed, the hind feet reaching considerably beyond the prints of the fore feet. And this forward throw of the hind feet underneath the body is one of the best criterions we can have of the horse being a good galloper.

The gallop being the pace of speed, it is natural to ask what feats of dispatch can be or have been performed by our fleetest horses. There is a story still rife among our jockeys, that the renowned Flying Childers ran a mile in a minute. This, however, is an exploit that never was, nor probably ever will be, performed by living machinery: for a course at the rate of sixty miles an hour we must make our medium of transport a steam carriage, and our road a railway. In 1772, however, according to our annals of sporting, a mile was run by Firetail in a minute and four seconds, which appears to be the greatest feat of speed on record*.

* I extract the following account of "The Flying Childers" from Captain Brown's "Biographical Sketches of Horses."

"This horse was well known by the name of the Flying or Devonshire Childers. He was the property of the Duke of Devonshire, who purchased him, when young, of Leonard Childers, Esq., of Cart House, near Doncaster. He was foaled in 1715, and was somewhat more than fifteen hands high. His sire was the Darby Arabian. He ran against the best horses of his day, and was never beaten. He was never tried at running a single mile, but his speed must have been almost a mile in a minute. Carrying nine stone two pounds, he ran over the round course at Newmarket, which is three miles, six

THE CAMEL.

PLATE VII.

THE CANTER.

I have already observed that the canter may be regarded rather as an artificial than as a natural pace; not that it is never seen in a state of nature, for, as I said before, foals may not infrequently be seen cantering after their dams: still, however, to perform it well or gracefully requires more training and practice than any other of the paces. Distinguishable at once as the genuine canter is from the genuine gallop, yet may a horse's gallop be so reduced or his canter so increased in speed that it may puzzle any of us to say whether the pace he is going be really a gallop or a canter. Mr. Blaine conceives that "at no period in this pace (the canter) is the horse *all in air;*" "whereas in the slow gallop there is a period in which the legs are all in air; so an essential difference occurs." Were Mr. B.'s *data* founded in fact, the distinction between the paces of canter and gallop would, indeed, no longer puzzle us; but the canter, no more than the gallop, is not uniformly executed by all horses: some horses there are that canter so slowly that, as Mr. Blaine observes, they have "always a point of contact with the ground:" others, on the contrary, there are that at every step in their canter manifestly carry all four feet *off* the ground; and so confound any definition we might construct in accordance with the going of the former. Lecoq calls the canter a gallop with four beats, and thus distinguishes it from the ordinary or hunting gallop, which has, he says, *three* beats, and from the racing gallop, to which he assigns but *two*. I need not, however, repeat here, it is my opinion that these asserted differences are not founded in observation. That, according as the rate of speed varies from the canter to the fleetest gallop, there will be great differences in the *time* of succession of the beats of the feet I have already admitted; but, that their *order* becomes different,

furlongs, and ninety-three yards, in six minutes and forty seconds. He also ran over the Beacon course, which is four miles, one furlong, and one hundred and thirty-eight yards, in seven minutes and thirty seconds; covering at every bound a space of twenty-five yards. On one occasion he made a spring or leap, with his rider on his back, on level ground, of twenty-five feet. Childers died at the age of twenty-six."

or that they become, as in leaping, perfectly *synchronous*, I very much doubt. Unfortunately, it is only in the canter and the slower rates of gallop that the matter admits of any sort of ocular demonstration.

The canter will not only vary as performed by different horses, but will also prove unlike any standard of the pace we may form in our mind according as it has been the product of instruction by a riding-master or as it has come naturally, or been the result of common-place training or practice on the road. The school or manage canter differs from the others in being a performance of more gracefulness, better carriage, and one that calls forth much more exertion of the bodily powers of the animal, particularly of his hind quarters: indeed, it requires certain form of body and action for its perfect execution, and on this account is performable only by horses in possession of such properties. The lopping or road canter—the careless, loose-reined swing in which the neck is straightened and the head protruded—is altogether a different performance of the same pace. Lecoq says, that the elevation of the fore quarter in the canter is the reason why the beats, which in the gallop were simultaneous, become separate and distinguishable, the fore limbs taking longer to descend than the hind ones: since, after all however, both pairs of feet (hind and fore) must take their turns in being planted upon the ground, and since the hind cannot accomplish progression without the aid of the fore limbs, the only difference this elevation of the fore quarters can produce is lengthening the interval the hind feet are upon the ground, according to the prolongation of that of the fore feet in the air.

All paces admit of improvement by practice, none in a greater degree than the canter. No other pace allows of the display of such grace and elegance of movement and carriage, and the manifestation of these is always a proof to us that the animal has either received "lessons in the school," or else has been used by a rider skilled in equitation. It is the easiest of the faster paces to the rider, and, perhaps, the least fatiguing to the horse when he has once learnt to perform it with facility, and on this account is often preferred by gentlemen, always by lady equestrians. A good cantering hack is a valuable acquisition. Some of the foreign

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horses canter with remarkable ease and elegance, a faculty they owe to the superior aptitude they possess over British horses of going upon their haunches; and nothing conduces more to engender this aptitude, where it is not natural in a horse, than school discipline, of which the continental horses in general get, I believe, a great deal more than our own horses do: indeed, with the exception of military horses and a few others, the nags used in this country rarely see the inside of a riding-school.

THE AMBLE.

We might regard what goes by the name of the *amble* as a pace truly artificial had it not been occasionally seen in foals, and, as Lecoq informs us, was it not natural to certain wild animals, in particular to giraffes? All equestrian writers appear to agree in their description of it—in its being a pace performed by the combined operation of the fore and hind limbs of either side; one biped being in the air while the opposite one is upon the ground, and thus alternating their action. Lecoq has happily likened this one-sided action constituting the amble to the gait of two men marching *à la militaire* in open file, with an interval of about a couple of seconds between their steps. We are informed by the same authority that every advance made by either biped amounts to about a third more than the admeasurement from fore foot to hind while the animal is standing still; and that while the pace is performing the hind foot invariably over-passes the print of the corresponding fore foot, thereby obtaining great advantage of leverage.

"If," says Lecoq, "the amble has with reason been banished from the manage, it is no less sought after, on account of the *douceur de ses réactions*, by persons who prefer ease or convenience to brilliancy of pace or action. A distinction, however, must be made between *the ambler by nature* and the horse in whom the pace is the product of education or the result of weakness."

In former days—in those good old days when the pillion was in fashion—the amble bears record of being a pace in considerable request: an ambling horse was a treasure as an easy and safe

roadster, and if not so very expeditious in his movements for a short distance, yet by his untiring continuance at the same rate at the end of a long journey was he found to have gone over more ground, and in less space of time, than any person unacquainted with his stealing pace would have imagined. At the present day, however, one never sees an ambling nag; neither are canterers so abundant as they used to be: walk, trot, and gallop, are all people in these days of reduction of every thing down to the scale of bare *usefulness* seem to care about.

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